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EDITORIALS

CREDIT.

In any business the question of granting credit is an important one, and the electrical jobber or supply house is no exception. Modern business is done largely upon a credit basis, and to attempt to eliminate this feature of trading is to at once bar out a large block of possible business. The real question is to so control and limit the extension of credits as to exclude those accounts which will result in ultimate loss without turning away reliable and responsible customers whose business would represent a profit.

The article by Mr. W. B. Parker on another page of this issue, emphasizes the proper basis for consideration of credit accounts. The two important elements are honesty and ability to pay. If either is lacking the account may end with a loss. Many an electrical contractor starts out with the best intentions in the world, but through ignorance of costs or unforeseen contingencies fails to accumulate the expected profits and winds up some large contract (or fails to complete it) with no cash left after paying his men, but with a large bill for material staring him in the face. Perhaps the contract was taken at less than cost, the bid being figured with the idea of cutting under the other fellow.

Much of the bidding under cost by inexperienced contractors has been blamed upon the jobbers who supply such disturbers with the wherewithal to do the work. If such a one risks his own capital and goes to the wall, he is the principal sufferer. But where such business is done on credit, the loss must be borne by the industry. In addition to this, every contract taken at less than cost helps to demoralize prices. There is reason, then, in the claim that the jobber should not extend credit without thorough investigation as to the reliability of a customer, as the indiscriminate financing of inexperienced contractors is likely to result in loss to all concerned. Careful scrutiny of all credit accounts, before rather than after the credit is extended, should be the rule in any business.

The only way to avoid the gambling on contracts referred to above is to have definite information as to costs. The cost of material is easily obtainable. Labor and overhead costs can only be determined with certainty from actual records of work performed. Every contractor should keep such records and should analyze them at intervals to see whether his costs are changing. The jobber is justified in refusing credit to any contractor who does not keep cost records, for such a one is taking risks which are likely to end disastrously to both himself and his creditors.

FUSE ABUSES.

If a doubt exists in the mind of any one as to the danger involved in overfusing or in replacing fuse elements by other conductors, it should be dispelled by a contemplation of the report of a fire which occurred on the premises of the Toronto Wood Specialty Company, in Toronto, about six weeks ago. According to the fire marshal, this fire was due to the substitution for the proper fuses of other fuses bridged with copper wire and hence too large in capacity for the circuit to be protected.

The object of the fuse is to protect circuits from overloading, which means overheating. Its general employment has attached a sense of security to the use of electric service. When a fuse is improperly replaced, this protection is removed, without, perhaps, the knowledge of those using electrical devices connected to the circuit. Reliance may still be placed upon the automatic prevention of the delivery of too much power for safety, but the sense of security has now become a false one. Through carelessness, ignorance or accident, a dangerous amount of power may be concentrated at a point where it cannot be controlled, with resulting injury to persons and property.

Overfusing a circuit is exactly analogous to setting the safety valve of a steam boiler for a higher pressure, and replacing the fuse with copper wire or its equivalent is analogous to tying the valve down. In both cases the protection, which is depended upon to prevent disaster, is removed. The practice is indefensible. One might expect to find it confined to the ignorant, the mischievous and the criminal. But this is not the case. It is usually those who are familiar with matters electrical who are responsible for instances of this kind. They find the protection works inconvenience at times, so they do away with it altogether, and take a chance that something disastrous will happen. The chance is usually a small one, and after several chances have been taken without serious result, the growth of a habit has been started. The seriousness of the resulting condition is realized only by those who come in contact with the resulting disasters.

Perhaps one thing which has encouraged the growth of this practice has been the custom of fusing circuits for a smaller current than the actual carrying capacity. For instance, circuits capable of carrying 15 amperes may have been supplied with six-ampere fuses because it was expected that the connected load would not be greater than this. When an appliance of greater capacity was attached to the circuit, and the fuse was blown,

a larger fuse, of say 10 amperes, was used to replace it. Again, one carrying 12 or 15 amperes has been used, the person making the replacement knowing that the circuit was not being overloaded. To others, however, his example may convey the message: Whenever a fuse blows, put in a larger one. And this is where mischief begins. Possibly it would have been better to fuse initially for the capacity of the circuit, and let it be understood that the limit was already reached. But it is too late to start such a practice now. The only hope of reform is in spreading a better realization of the value and proper use of fuses and the dangers arising from their abuse.

The fire referred to above may lead to legislation aimed at correcting this bad practice in that particular locality, and perhaps it would aid inspectors and others interested in safety if overfusing were universally made a misdemeanor, punishable at least by a fine. By pressing a few cases and giving publicity to the results, a deterrent influence could be exercised and attention focused upon the danger involved.

MAGNETIC PERMEABILITY INDISPENSABLE.

The important part which the magnetic properties of iron play in modern life is realized by few besides the electrical expert. Nearly all electrical machinery makes use of these properties, so that except for the high permeability of iron we should be without the dynamo and motor, and nearly all the industrial applications of electricity would fail. If iron were non-magnetic the electric lamp, the trolley car, the telephone and the telegraph would not be commercial possibilities. The electric bell, the annunciator, and most forms of electric signals could not operate in their present form. Motor vehicles would be inoperative, whether electric or gasoline, since the latter depend upon magnetos. The mariner's compass of the older type would be useless, and the gyroscopic compass would be incapacitated for lack of its driving motor. X-ray apparatus in its present forms would cease to operate. In fact, nearly all the activities of modern life would be interrupted. Even steam railroads would be temporarily deranged, since their operation is dependent upon electrically operated signals, the telegraph and the telephone; and the newspapers would have scant news. The effects of strikes and even war are moderate in comparison.

The above indicates in some measure what the world owes to the electrical engineer, for all of these developments have been worked out in his domain. Modern civilization, especially urban civilization, is dependent upon his efforts. The unfamiliar force of a century ago is the basis for most of the conveniences of today. Electrical current is the modern servant, yet with the magnetic permeability of one of our most abundant metals lacking, we should feel helpless in our inability to utilize it. Nature has many wonderful secrets, but none is more wonderful than that of ferromagnetism, which so far has defied the efforts of scientists to explain.

ELECTRICITY IN SHOE FACTORIES.

The use of electrically heated shoe machines is a form of industrial application of electricity which is of growing importance. There are now no less than a score of such machines, all of which are recognized by the factory operators as of great serviceableness and efficiency. Two factory-equipment manufacturers, at least, produce shoe machines with electric heating units, some of which are separate devices and some attachments for existing machines. Central-station men in shoe-manufacturing centers will do well to cultivate this class of business, as its introduction means a valuable day load.

The tendency in modern factories is to install electric drive in small groups, by this means it being possible to run each department without operating the whole driving equipment.

This means a considerable saving, as it is well known that shaft drive from a steam plant involves large power losses in transmission. In one case it was found that in transmitting steam power by belts from the engine room to the seventh floor there was a loss of 80 per cent in power. Electric power is delivered to the machines with a minimum of waste, while electric heating devices obviate the risk of damage to shoes which the use of gas-heated devices involves. The resultant work with the electric machines is vastly superior, and the health and comfort of the operatives is another important consideration.

ELECTRIC POWER IN SILK MILLS.

The first electrical installations in textile mills were for the purpose of illumination, and the earlier motor applications were incidental and were usually fed from the lighting circuits. Today electric drive is recognized as the most ideal for this class of work, and especially for silk weaving, where slight variations in speed or other irregularities in operation are sufficient to snap the slender threads and introduce imperfections in the finished product. An article in this issue describes the process of silk manufacture, shows the advantages of electric drive, and illustrates the application of central-station service.

Individual drive possesses the greatest advantages for loom work, but considerations of investment expense have directed the installation of group drive in many factories. The use of belts is a recognized evil, as slipping is decidedly disadvantageous, and chain drive between motor and shaft is being widely adopted. Chain drive is also finding favor in place of gearing in the machines. Uniform speed is highly important in all textile work, and perfection of output depends upon the accuracy with which it is maintained. As silk is a costly material, the financial importance of good speed maintenance reaches its culmination in this industry.

Accurate maintenance of speed, as attained through motor drive, also results in maximum output. It is not safe to exceed a certain specified speed, yet within

this limit output is approximately proportional to speed; consequently the likelihood of large variations in speed requires the adoption of a lower average speed. Other objections to the use of belting and shafting are the same as those encountered in other industries: obstruction of light, liability to accidents, expense of maintenance, possibility of oil stains on the goods, etc.

Three-phase motors are the most desirable for this work, as they represent the nearest attainment to constant speed and have the best starting characteristics. Fluctuations of voltage will not appreciably affect the speed with this type.

Since electric drive is found to improve both the quality and quantity of output, it would be a valuable innovation at increased cost. When the power salesman can demonstrate that the cost will be decreased or even kept on a par with steam drive and shafting, he should have no difficulty in convincing the prospective customer. That the load of a silk mill is a desirable one for the central station is shown by its excellent load-factor.

PROGRESS AMONG CONTRACTORS.

The success which has attended the methods of the California Association of Electrical Contractors and Dealers not only in organizing its own members, but in dealing with the jobbers and central stations, has not only attracted wide attention, but has stimulated activity among others. The first evidences of this have been noted in the neighboring Pacific States. The electrical contractors of Oregon and Washington have set themselves the task of some real accomplishment along lines that may well be considered in other parts of the country. Co-operation among all the elements in the electrical industry is bound to bring better results than indiscriminate, individual effort, and the first requirement for this co-operation is the organization of each element in a way that will permit joint action. Collective effort and mass action are essential to large accomplishment.

The electrical contractor has represented the weakest link in the electrical chain. His status is rapidly being improved, however, although progress sometimes seems slow. Results are not always immediate, and patience and perseverance are necessary for realization of ideals. Only by co-operative and persistent effort can great accomplishments be achieved. The contractor who fails to join with his fellows in an organization for mutual benefit is standing in his own light. When the contractors in any community are well organized, they are then in a position to deal with the representatives of jobbers, manufacturers or central stations in removing causes of friction or remedying conditions which at present seem detrimental to their interests.

We trust that not only the contractors of Oregon and Washington, but those of other states will proceed to push matters after having had such a demonstration of possibilities as has been given in California.

MAKING CONSTRUCTION NEWS INTERESTING.

A real opportunty for helpful publicity exists on many central-station systems supplying communities in which the local press is alive to the interest of construction developments. Much has been said about the benefits of cultivating the good will of reporters by a readiness to impart information of news value, and many central-station managers put this into practice when the decision to purchase new equipment or to alter the plant is made. This done, the possibilities of news material being produced while the work of installation and construction is under way are often completely overlooked.

When the work under way can be connected with affairs of general interest, as in the following example, the popularity of the item is sure to be greatly increased. Thus, in an Eastern city a local daily recently carried a story to the effect that a new substation in an adjacent town served by the lighting company had been much delayed in its completion by the freight embargoes on various materials used on the interior of the building. It was pointed out that the installation of the switchboard and other equipment was progressing well, but that about two months more work on the substation would be necessary before regular service could be inaugurated Now all this is easy material to supply the local press. It requires no editorial skill on the part of the busy central-station manager; keeps the public posted on the progress of the local improvement, in which it is interested in inverse proportion to the size of the town; and adds to the constant playing up of electric service which is valuable in the development of central-station business. Mention was made in the item above cited of certain temporary arrangements for the supply of electricity and the success with which these had been accomplished without perceptibly affecting the consumers, all of which redounded to the credit of the management, and lent attractiveness to the reading matter.

When new machinery arrives, a kodak view of the heaviest piece as it is being unloaded from the cars, coupled with a few figures as to the number of horses a power-producing unit of this type offsets, makes good copy for the local daily or weekly. There is always a large number of local newspaper readers who are interested in machinery, and a few words about a design new to the town will not come in amiss. When, as occasionally happens, some town has the engineering honor of making the first use in the world of some new apparatus of novel design, there should be no difficulty in serving it to the readers as a front-page story, provided the local manager makes its significance known to the editors, as he can generally do without much trouble. The best thing about all such material is that it is almost always available for the reading pages without a cent's outlay. Moreover, such material does not have to appear on a particular date, and conflict with important news can easily be avoided.

Happenings in the Industry

Dallas Voters Approve Model Franchise for Utility Companies and Authorize Bond Issue for Municipal Plant—Safety Code and Electrolysis Are to Be Discussed at Atlanta Meeting—Discussion of Motor Design Before Lynn Section—Dr. Steinmetz Addresses New York Section, I. E. S.—Miscellaneous News

AMENDMENTS TO DALLAS CHARTER CARRY BY SMALL MARGIN.

Result Is Really a Victory for Traction and Lighting Companies.

One of the most hotly contested elections ever held in the city of Dallas, Tex., ended on April 4, the final count, as noted in our last issue, showing that the voters favored the proposed franchise amendments to the city charter. These amendments provide for a "service-at-cost" feature and a fixed rate of return on a definite fixed valuation. At the same election $500,000 of bonds were voted for the construction of a municipal electric light plant, these bonds to be used in case no acceptable terms could be arrived at with the Stone & Webster interests which operate the local electric light plant.

The franchise charter amendment received a majority of exactly 81 votes and this is so small that the election is considered in many circles as really a victory for the central station and traction interests. The fact that a large number of qualified voters did not express their opinion on the subject is construed as meaning that the entire subject is one which the people as a whole do not understand. It furthermore indicates a sense of justice on the part of the people, as opposed, in part at least, to the proposed franchises on account of the fact that they are not fair to the operating companies.

Regardless of the general sentiment, however, future action will be based largely on the course taken by the Mayor and Board of City Commissioners. The Mayor was the sponsor for the "model" franchises and was supported by the majority of the city commissioners. It has been stated that action will be taken at once to put the mandate of the people into effect. The bond issue for the municipal lighting plant will no doubt be used as a club to force the operating companies to accept the franchises if they continue the stand taken before the election, namely, that the valuations fixed were entirely too low and the rate of return not sufficient to provide for extensions to service and future growth. If the Mayor and Commissioners persist in the course which it was indicated they would take, the entire matter will no doubt be carried through the courts to a long and expensive settlement.

What the Franchises Provide.

The franchise ordinance which was passed "grants a franchise covering existing street-railway systems consolidated in one ownership and fixes the valuation of the properties thereof at $4,790,124.14, with an addition of $48,000 for working capital, and providing for an interest fund of $150,000, and fixes the maximum rate of return to the franchise holder at 7 per cent on such valuations and on future additions thereto for improvements made under city supervision, and provides that such part of the receipts of the business as remain after deducting such sums as are necessary and proper for operation, taxes, maintenance, renewals and replacements and the rate of return specified shall be applied to the reduction of fares; provides how such fares may be reduced; and provides for strict supervision and control by the city over service and over the affairs of the franchise holder; and provides how such supervision and control shall be exercised."

It has been brought out that the operating company (Stone & Webster) is agreeable to the "service-at-cost" plan embodied in the franchise, but does not agree on the valuation as fixed and further contends that a return of 8 per cent should be allowed.

The lighting ordinance "grants a franchise covering the existing electric light, heat and power system operated by the Dallas Electric Light & Power Company and fixes the valuation of the properties thereof at $3,485,964.42, with an addition of $75,000 for working capital and provides for an interest fund of $150,000 and provides as a maximum rate of return during the first eight years of the franchise at 8 per cent on such valuations and additions thereto for permanent improvements made under city supervision; and provides as a maximum rate of return, after such period of eight years 7 per cent on said valuations and additions; provides that such part of the receipts of the business as remains after deducting such sums as are necessary and proper for operation, taxes, maintenance, renewals and replacements and such maximum rates of return shall be applied to the reduction of rates and provides for strict supervision and control by the city over service and affairs of the franchise holder, and how such supervision and control shall be exercised."

In this case also the operating company is agreeable to a fixed rate of return and a reduction in rates when possible, but does not agree to the valuation fixed nor the rate of return specified.

The majority of the press favors a compromise of the situation and a settlement out of court. It is pointed out that since the mayor and commissioners now have power to take action, they should use this power to bring about a mutually agreeable compromise rather than resort to long and costly litigation.

Contrary to the general custom which has characterized recent controversies of this kind, no paid advertising was used by the operating companies to place their views before the public. With the vote as close as it was there seems little doubt that a strong publicity campaign might have changed the result of the election. The next steps in the matter will be taken when the officials of the lighting company appear before the Board of Commissioners to show why they should not make an immediate reduction of two cents per kilowatt-hour in the lighting rate.

Conference at Atlanta on Safety Code and Electrolysis.

At the invitation of the Technical Committee of the Affiliated Engineering Societies of Atlanta, Ga., the Bureau of Standards will hold a conference in that city from May 2 to 4 for the purpose of discussing the work of the Bureau in connection with the National Electrical Safety Code and the prevention of electrolysis of gas and water pipes, cable sheaths, and other metallic underground structures. The conference will be participated in not only by the technical societies of Atlanta under whose auspices it is to be held, but also by city electricians, engineers of public-utility corporations, consulting engineers, and others interested, and a large attendance is expected from Georgia and the neighboring states.

The conference will occupy three days. The first day, May 2, will be devoted to the consideration of the National Electrical Safety Code. At this session representatives of the Bureau of Standards will outline the work that has been done on the code and give a statement of the principal features of the code and the main changes that have been made in the course of its last revision, after which a general discussion of the code will be held.

At the second session on May 3, an account of the work of the Bureau of Standards on electrolysis prevention will be presented, including the laboratory researches and field studies and surveys that have been made, and giving a discussion of the proper methods of procedure in making electrolysis investigations and in the mitigation of electrolysis troubles. This paper will also be followed by an open discussion.

At the third session, on May 4, the subject of grounding of low-voltage light and power circuits will be discussed. As in the other sessions, the discussion will be preceded by a paper setting forth the essential provisions of the National Electrical Safety Code regarding the grounding of circuits and explaining the advantages of grounding, the methods of grounding, and the reasons which have led to the adoption of the code requirements.

The chief purpose of the conference is to bring the cities and the public-utility corporations of the South into closer touch with the work of the Bureau of Standards in connection with public-utility problems. All persons interested in the safe construction and operation of electrical lines and equipment and in the mitigation of electrolysis of underground pipe and cable systems are invited to attend the conference.

Dr. Steinmetz Addresses New York Section, Illuminating Engineering Society.

Attendance records were broken at the meeting of the New York Section of the Illuminating Engineering Society held on the evening of April 6 at the Engineering Societies Building, New York, there being over 300 present.

Chairman D. Mc. Farlan Moore introduced the speaker who was Charles Proteus Steinmetz, president of the Society.

In his opening address Dr. Steinmetz attacked the selected subject, "General Problems of Illumination Design," by stating that illumination was not simply a branch of applied science, as the effects have to do with our physical well-being and success or failure—a mental condition. Continuing, he said that the variety of uses to which light was put was very well exemplified in domestic lighting, where we wanted low-intensity general illumination to provide a restful condition, high-intensity general illumination when we desired to find something and high-intensity local plus low-intensity general illumination for reading.

The three objectionable features of lighting were named as glare, fatigue and association. Glare is objectionable due either to excessive intensity of luminous area, either actually or relatively. Fatigue may be produced in a number of ways, overexertion for a short period, too extended a period of ordinary use, not enough light and too much diffusion, shadows being eliminated. The lighting conditions that are best arranged so that fatigue be avoided are those providing sufficient illumination, shadows and contrast. Association termed as an objection means color effects that bring to our mind something unpleasant.

Color was said to be the least studied of the phenomena of lighting. With the new gas-filled lamps the efficiency is relatively so high that absorption glasses or other screens may now be used at a reasonable cost. In nature, yellow, brown and reddish brown are the colors which predominate, and therefore are the ones that are most restful.

Successful lighting must include a source that contains a sufficient proportion of the ordinary colors found in nature so that proper color values will be reflected back to the eye of the observer, the light must be of sufficient intensity, be shaded and have direction so that shadows and background will give ease of vision and proper proportion.

Preston S. Millar announced that the lectures on "Illuminating Engineering," to be given under the joint auspices of the Society and the University of Pennsylvania, would begin on September 21, following immediately after the annual convention of the Society.

Lecture on Motor Design Before Lynn Section of the A. I. E. E.

The fourteenth and concluding lecture of the fall and winter lecture series of the Lynn (Mass.) Section of the American Institute of Electrical Engineers was given on April 5 by Louis E. Underwood, a motor engineer of the General Electric Company. The subject treated was "Progress in the Art of Motor Design and Manufacture," and consisted of an historical survey, and a technical elucidation of present-day motor applications. The talk was illustrated by lantern slides and models.

Beginning with Faraday's fundamental experiments in 1830, when the source of power was direct current generated by primary batteries, the speaker traced the evolution of the art in the use of both direct and alternating current through the work of many inventors such as Pacinnoti, DeMeritans, Gram, Edison, Thomson, Bentley, Knight, Sprague, Tesla, VanDepoele, Eickmeyer, etc. So completely did these inventors and other notable pioneer experimenters cover the field that progress during the last 20 years has been along the line of improved applications of manufacture and refinement of details leading to efficiency rather than to basic discovery. Today there is little haphazard work, everything being first calculated from an engineering standpoint and then standardized in manufacture. The quality of such materials as the steel and iron used in the magnetic circuit, the quality of copper in commutators, and of the carbon in brushes, are all found to be of vital importance.

The processes of motor manufacture, as shown by the lantern slides, illustrated how each move in construction is a study of efficiency in bulk operation. In connection with some of the interior views of Building 74 of the River Works plant of the General Electric Company, at Lynn, it was stated that this is the largest building in the world exclusively devoted to motor manufacture.

Power Sales Bureau of N. E. L. A. to Give Dinner.

Final arrangements are being made for the "get-together" dinner of the Power Sales Bureau of the National Electric Light Association to be held in Chicago, Ill., May 23, which will be during the national convention. It is expected that over 200 power salesmen will be in attendance. The program of the evening will consist of a number of short talks by power men from various parts of the country, together with a goodly number of entertainment features.

The committee in charge of the local arrangements consists of: George H. Jones, Commonwealth Edison Company, chairman; W. T. Dean, General Electric Company; Stephen Gardner, Westinghouse Electric & Manufacturing Company; Sidney Vigo, Middle West Utilities Company; C. W. PenDell, Public Service Company of Northern Illinois; R. G. Hunt, H. M. Byllesby & Company, and William Ott, Commonwealth Edison Company.

Miscellaneous NEWS NOTES

State Commission Sides with Utilities.—Rates under which energy for street lighting in the cities of Gadsden, Alabama City and Attalla, Ala., is furnished cannot be lowered at the option of the city government, according to an opinion of the Public Service Commission.

To Transmit Students' Wireless Messages.—The Harvard University Wireless Club has arranged to transmit students' messages from its wireless station at Cambridge, Mass., free of charge, to amateur stations on working relations in a zone bounded by central New Hampshire on the north and New Jersey on the south.

Mechanical Engineers to Discuss Industrial Preparedness.—Among the papers to be presented at the spring meeting of the American Society of Mechanical Engineers, at New Orleans, La., April 11 to 14, is one by Spencer Miller, on "Organizing for Industrial Preparedness." The whole of the first session will be devoted to a discussion of this subject.

School for Firemen Effects Coal Economy.—The electric plant of Topeka, Kan., carrying 285 kilowatts the first three months of 1916 against 260 the corresponding period in 1915, used only $1,924.06 worth of coal, or $248.74 less than in January, February and March, 1915. While the renovation of the boilers and the addition of a damper in the stack were instrumental in the saving, the largest factor was a school for firemen in the art of stoking.

Illinois Fire Marshal Appeals to Electrical Industry.—Walter H. Bennett, state fire marshal of Illinois, was the speaker at the weekly meeting of the Electric Club-Jovian League of Chicago on April 6. Mr. Bennett called attention to the enormous fire loss which occurs annually and which could be appreciably reduced by the exercise of greater care. He appealed to the electrical fraternity of Chicago to use all influence possible to guard against the use of electrical equipment in such a way as to prove hazardous from the standpoint of fire.

North Carolina Power Sites in Litigation.—Because the trial judge erroneously found the facts in ordering a perpetual injunction, there must be a new trial in the case of the Carolina-Tennessee Power Company vs. the Hiawassee River Power Company, according to a ruling delivered by the Supreme Court of North Carolina. The case involves very valuable Hiawassee River power plant sites near the Tennessee line. The defendant corporation was obtaining titles to lands to which the plaintiff held prior claims, and the overthrow of the perpetual injunction reopens the fight for control of the power sites in dispute.

Louisville Jovians Hear of Plans for New Power Development.—Louis S. Streng, superintendent of the power department of the Louisville (Ky.) Gas & Electric Company, featured the last meeting of the Louisville Jovians, with a brief sketch of the plan of extension of the company's Waterside plant. It will ultimately mean about four times the present power capacity and will represent the latest developments in the way of the electric power plants. Speaking of the amount of water used, Mr. Streng stated that now, with present requirements, the company pumps every day twice as much water as the Louisville Water Company, while when the additions are completed the water volume will be quadrupled. Construction of the tunnels to the river, the intake and the outlet tunnels, will involve some of the most unusual engineering work ever done around Louisville. These tunnels are 700 feet long, extend 35 feet into the river and will be constructed in the bottom of a trench to be dug. Greatest depth of excavation will be 45 feet and the open caisson system of construction will be employed.

Electrically Driven Barge Launched.—The first of thirty-six steel, electrically driven, quadruple-screw barges projected by the Inland Navigation Company, has been launched at the Howard Shipyards, at Jeffersonville, Ind. The power is generated by five internal combustion engines, and a wireless equipment is provided. The maximum draft is 3.5 feet and maximum capacity is 1,500 tons.

Injunction Issued Against Memphis Utility Bond Issue.—Although Chancellor Fentress, at Memphis, Tenn., has held the city authorized under the bond issue act to build or buy, as it chooses, an electric-lighting plant, at the same time an injuction has been issued against the issuance of $1,500,000 bonds on the ground that sufficient legal notice of the election was not given. If the higher courts sustain this finding, it is stated, another election will be necessary. The city proposes to buy the plant of the Merchants Power Company.

Los Angeles Jovians Entertain Riverside Delegation.—At a meeting of the Jovian Electric League of Los Angeles, Cal., held April 5, a delegation from Riverside, representing the Southern Sierras Power Company, was welcomed. Short talks were made by A. S. Cooper, assistant treasurer, and H. R. Day, purchasing agent. The principal speaker of the day was I. B. Potter, attorney for the company, whose subject was "Co-operation." He pleaded for a wider and more useful effort and stated that the possibilities for usefulness by co-operative work on the part of the Jovian Electrical League could not be measured, and that the main thing was to extend and perfect the organization—its sphere of usefulness was unlimited. A. E. Morphy, of the Southern California Edison Company, presided, and K. E. Van Kuran, of the Westinghouse Electric & Manufacturing Company, was chairman of the day.

Kansas City Company Issues House Organ.—The publicity department of the Kansas City Light & Power Company has issued the first number of "Electricity," the monthly house organ, for distribution to the employees and the public. It is 9 by 6 inches, 32 pages and cover, and profusely illustrated. There are brief editorials under the heading "Short Circuits"; two pages of notes on "Electricity in Many Climes"; a page of "Selling Points," applicable to any business, mostly helpful for selling goods by the aid of electricity; a page of notes on electrical devices, headed "Do It Electrically"; a page of recipes for electric cooking; two pages devoted to the Kansas City section of the N. E. L. A., which has made the publication its official organ; two pages of notes about employees of the company; the beginning of a series of cleverly-written biographies of employees under the heading "Who's Who and Why They Are—Light Celebrities"; and articles by department heads. The magazine has the sub-title "Regeneration of the Home."

Arrangements for Manufacturers' Exhibits at Chicago N. E. L. A. Convention.—H. G. McConnaughby, secretary of the Exhibition Committee of the National Electric Light Association, is busily engaged in completing plans for the exhibition to be held coincident with the convention in Chicago on May 22 to 26. The main exhibit space will be in the Auditorium Theater, adjacent to the official hotel, where ample facilities will be provided for exhibits of any character. A circular letter and application blanks for space have been sent to all Class D members and the early responses indicate one of the best representations of any so far held. In spite of the large space provided for exhibits, however, Secretary McConnaughy cautions manufacturers to make early reservation in order to secure desirable space and to guard against any possibility of a disappointment because of no room.

Code Requirements of Electrical Apparatus

Some Suggestions for the Small Manufacturer That Will Aid in the Production of Electrical Apparatus and Material That Meet Code Requirements

How should a new piece of electrical apparatus or machinery be constructed that it may be safe as to insulation, acceptable in that its use in a building will not introduce a fire hazard, and so constructed that it will meet the requirements of standard engineering practice?

These queries are not difficult for the large electrical organization, with a corps of expert engineers and a well equipped testing laboratory, to answer.

Of the numberless devices brought out every month to do something a little better or to do a new work in the home, office or factory, a large percentage are the work of the individual or of the small company.

WHAT THIS ARTICLE TELLS YOU

How a new piece of electrical apparatus or machinery should be constructed that it may be safe as to insulation.

How it should be constructed so that its use in a building will not introduce a fire hazard.

How it should be constructed so that it will meet the requirements of standard engineering practice.

While the older and larger electrical companies fail in some particulars to build a new machine that will stand criticism, the individual inventor and the small company fail most frequently in designing and constructing a piece of apparatus that does not require considerable changing to bring it up to the right standards.

As an inspector for insurance interests for a number of years, it was the writer's good fortune to be asked many times to look over new electrical appliances and to give the builder some suggestions as to whether or not the apparatus in question was built to meet city inspection bureaus' and underwriters' requirements. As these organizations rely very largely upon rules laid down in the National Electrical Code this article will, with Class D of the Code in mind, point out common faults, some of which are found in nearly every new piece of electrical apparatus, indicate construction that should be avoided, and suggest at the same time good construction.

In some instances, inspection of an electrical device discloses the use of fiber as the material upon which current-carrying parts are mounted. The use of hard fiber for this purpose has not been considered good practice for some time, because its dielectric strength is not high, and on account of its sensitiveness to humidity, trouble arising from absorption of moisture. It is true that by slow drying it will regain some of its initial qualities, but if in a location where a high temperature dries it out it loses its elasticity. Its use, therefore, in electrical work is confined to the insulating of small current-carrying parts in such devices as plug fuses, sockets, receptacles, and as bushings for pin contacts, etc., where large pieces of the material are not necessary. Its employment in this manner was brought about some years ago when the cost of mica became so high that a substitute was sought. It should be emphasized, however, that its use as a substitute for porcelain or slate as a base for mounting current-carrying parts has not met with favor and from the results of experience the National Electrical Code specifies that such parts must be mounted on non-combustible, non-absorptive insulating bases such as slate or porcelain. Examples of devices where bases of this kind are required are switches, fuse blocks and in general all electrical current-carrying parts. An exception to this rule has been made in permitting the use of such materials as transite ebony, asbestos board, hemit, gummon and bakelite-micarta as proper for panelboards.

In mounting current-carrying parts, such as knife switches and fuses, on bases as in building a panelboard, certain spacing of parts of opposite polarity should be observed, care being taken that these distances are not less than a minimum as required in Class D of the Code. Note should be made also that parts in the air may be closer together than these same parts, carrying the same voltage, are permitted to be where mounted against the same surface.

Code requirements as to spacing of current-carrying parts for some of the more common electrical fittings may be found under the following rules in the 1915 Code; knife switches, rule 65*k*; snap switches, 65*l*; fuses or cutouts, 67*j*; panelboards, 69*b*; sockets, 72*q*.

In connection with the mounting of current-carrying parts of switches, it is quite frequently found that the bolts or screws through the material upon which the switches are mounted are left flush with the under side of this base. In all cases where these bolts, screwheads or nuts are alive, they should be countersunk into the under side of the base at least one-eighth inch and should then be covered or sealed with some good waterproof compound that will not melt when subjected to a steady temperature below 150 degrees Fahrenheit. Several of these compounds are on the market. This construction applies as well to screws used in the mounting of current-carrying parts of circuit-breakers, cut-outs, rosettes, etc. In porcelain pieces, such as sockets, all screws which can be sealed firmly must be sealed with a waterproof compound which will not melt below 200 degrees Fahrenheit.

The reason for countersunk and sealed construction is found in the fact that many fittings, particularly switches and cut-outs, are often mounted directly on the back of a metal cabinet or inclosure where exposed live screwheads or nuts on the under side of mountings would come in contact with the metal of the cabinet and thus afford a direct means for forming a ground.

Should devices such as panelboards be mounted out on posts or brackets, away from the back of the cabinet, this countersinking and sealing need not be observed, the spacing and means of support providing the needed security against the contact of current-carrying bolts and screws with the metal of the cabinet. To be more specific, exposed live metal parts on the back of the panelboard should be spaced at least 0.5 inch from the metal of the cabinet in which the board is mounted.

A common fault found in many appliances is the lack of proper means of securing the wires, from the source of current supply, to the device terminals. If the current taken by the appliance is more than 30 amperes, regular lugs should be provided into which the ends of the wires can be soldered. These lugs should be screwed or bolted to the terminals. The most common example of these lugs can be found on any standard knife switch rated to carry more than 30 amperes. For terminals taking 30 amperes or under, either of two ways of securing the wires may be employed. The first is by means of two brass washers held under a nut, the wire being placed between the washers, thus affording two flat surfaces bearing against the wire. The second and more common method of holding wire is by providing an upturned edge or lug, the upturned end projecting slightly beyond the edge of the nut and a washer. When the wire is placed under the washer and the nut turned down the wire is kept from sliding out from

under the washer by the upturned lug and the washer provides a flat, tight contact. While considering the matter of connections, it should be emphatically stated that the old-style set-screw connections, such as may be found on the terminal posts of ordinary dry batteries are no longer acceptable, the reason being that a set screw turned down upon a wire gives a contact at only one point, is very apt to become loose, and in practice has been found to invariably cut the wire in two.

A point which should be taken care of by the builder of a device taking current through a portable cord, is to provide some means for preventing a pull upon the cord from being transmitted to the terminals to which the cord is attached. A porcelain cleat clamping the cord inside the device may be used for a strain relief and in other cases where the cord passes out of the case of the device through a bushed hole, a knot in the cord upon the inside is acceptable. If a length of portable cord is supplied with the apparatus, it should have wires of a carrying capacity large enough to carry the current required and as specified in the Table of Allowable Carrying Capacity of Wires, rule 18 of the National Electrical Code. Further attention to the kind of portable cord used should be given to see that the cord is the kind specified for the particular purpose under rule 51 of the Code.

A further requirement, as to connecting to the supply circuit where a plug is used, is to provide a plug rated for the voltage and current that the device to be operated requires.

Where pressing irons or elecric air heaters are concerned, the plug must be of the separable type so that when it is pulled out either at the heater or at the receptacle on the supply circuit, the projecting blades will be "dead." Further, ordinary reinforced cord is not suitable for supplying current to heaters, in that it is rubber insulated. A special standard asbestos-covered wire is on the market for this purpose.

Referring again to knife switches, the mounting of which has already been considered, the following points should be met in their construction. The hinges and jaws should be mounted so that they cannot turn or be twisted about. Dowel pins or square shoulders set in the mounting, or two screws instead of one to hold the part may accomplish this. There should be enough metal in the current-carrying parts of the switch so that under its rated load the rise in temperature will not be more than 50 degrees Fahrenheit. Between the blade and the jaws and also at the hinges 75 amperes per square inch of surface should be approximated and a cross-section of the blade should be figured at the rate of 1,000 amperes per square inch. Spring washers are required at the hinges to make a steady, tight contact. Knife switches should carry without any ill effects a 50-per-cent overload at 25 per cent above the rated voltage. Minimum spacings and dimensions for various currents and voltages are given in rule 65*k* of the Code.

When 30-ampere, panelboard, spool or combination handle switches for any piece of apparatus are mounted in a cabinet, the cabinet should be deep enough so that the door will close when the switches are in any position.

In many instances manufacturers buy the parts of knife switches and mount these parts on a base, then place this base on the apparatus. Besides the suggestions already offered, care should be taken in drilling holes for supporting screws of the switch base either to countersink or locate the holes so that there is at least one-half inch between the head of the screw and the nearest current-carrying part.

Illumination being a recently much studied field, electric fixtures are being placed on the market by numerous concerns. Aside from sturdy construction, one of the most important things to consider in building these is to be sure to provide a smooth race-way for the wires, so that when these are pulled in, they will not be drawn around sharp corners or over burs and the insulation be scraped off the wires and a chance for a ground or short-circuit provided. In fixtures designed for show cases where the heat radiated by the lamps will be transmitted to the fixture and the likelihood that a temperature of 120 degrees Fahrenheit will be reached about the wire, slow-burning wire is required. This feature is given special notice in rule 35*d* of the National Electrical Code dealing with the high temperature liable to be reached in fixtures within buildings and designed for gas-filled incandescent lamps. Slow-burning or asbestos covering on the conductors is required where the temperature to which the wire is subjected at any point exceeds 120 degrees Fahrenheit. In designing fixtures for gas-filled lamps in which the lamp or lamps are close to the ceiling and outlet, the fixtures should be so ventilated or arranged as to keep the temperature of the wire of the branch circuit (which is rubber-covered) below the temperature just noted.

No splices or taps are permitted in arms or stems of fixtures. In chain fixtures the wire used must be flexible; that is, not solid wire, but made up of several small strands equivalent in carrying capacity to the solid conductor which would be required. In this type of fixture the reason for the use of flexible wire is obvious.

The old style of canopy "bugs" which could be readily loosened or removed from the canopy, are no longer acceptable. Hard fiber may be used as an insulator of the canopy from surfaces and must be secured to the canopy by rivets or screws. Rule 77*c* of the Code covers the dimensions of fiber canopy insulators and the details of securing them.

A new section entitled "Garages," added to the 1915 Code as rule 42, contains some construction requirements as to electrical charging equipments. Devices, such as switchboards or charging panels, should be so built that they can be mounted or located at least four feet above the floor, or surrounded by vapor-proof enclosures. In the matter of charging sets, the motor and dynamo if of the fully inclosed types may be located on the floor of the garage. Motors even if installed four feet above the floor of a garage if not of the fully inclosed type must have the openings covered by a wire screen of not less than No. 14 mesh at the commutator end. The point as to these requirements is to guard against arcing of switches or commutators near the floor of a garage where there is the greatest danger of heavy gasoline vapors being present in a very fit condition for ignition by arcs or sparks.

The installation of motors in motor-operated appliances requires careful consideration. One of the present-day practices which is more and more being observed both by manufacturers of motors and by builders of motor-driven devices is to favor the motor having no exposed terminals. Such motors have wires running into the frame through bushings, the connection terminals being inclosed. These bushings may be of soft rubber unless so placed that oils, grease or other substances having a destructive effect on rubber are present. In picking a motor for such a location see that these bushings are of hardwood having a moisture repellant filler. Porcelain or micanite are also suitable materials for bushings where oil is in evidence. Again, motors of the inclosed type or especially those having the commutator end inclosed are preferred. A case in point is the installation of a motor in an electrically driven piano-player. Motors in these instruments should be placed so as to be readily accessible and inasmuch as they will probably lack proper maintenance such motors should preferably be of the inclosed type, so that any breakdown, which it is quite possible may be the only time the motor will be given attention, may occur without subjecting the wood interior of the instrument to sparks. The same construction here cited will apply to the numerous motor-operated household appliances that are constantly being brought out.

All electrical apparatus must be built so as to withstand certain high-voltage tests. The conditions under which these tests are made are stated in the Standardization Rules of the American Institute of Electrical Engineers.

The builder of apparatus should have in mind in general the high-voltage test to which his device will be subjected and plan the insulation accordingly.

High-voltage tests are made at the temperature the device attains under normal operation. For example an electric pressing iron would be tested for its insulation when, with the current on, the iron has reached a constant temperature.

The test voltage is applied between each electric circuit and all other electric circuits and grounded metal parts or the frame.

The standard test for all classes of apparatus, with some exceptions, is twice the normal voltage of the circuit to which the device is connected, plus 1,000 volts. Some of the more common exceptions are household apparatus, bell-ringing transformers, switches and circuit control apparatus above 600 volts. Household apparatus taking not over 660 watts and intended only for operation on supply circuits not exceeding 250 volts must stand 900 volts, except in the case of heating devices. These shall be tested with 500 volts at operating temperature. Bell-ringing and toy transformers must withstand for one minute the application of 2,500 volts alternating current between high and low-voltage coils and between high-voltage coil and core or case. Switches and circuit control apparatus above 600 volts must stand a test using 2.25 times the rated voltage, plus 2,000 volts.

The builder of electrical apparatus who provides good insulation with acceptable material goes far in avoiding trouble when bringing his equipment forward for the consideration of its fire hazard by the fire insurance interests.

A final requirement as to any electrical device is that it carry a name plate bearing the name and address of the manufacturer together with the rating in watts or amperes and the voltage of the circuit upon which it is intended for use.

Photometry of the Gas-Filled Lamp.

The new high-efficiency gas-filled lamp introduces variables not hitherto encountered in the photometry of incandescent electric lamps. This matter has been made the subject of a study by the Bureau of Standards, and the results are published in Scientific Paper No. 264.

On account of the comparative broadness of the filament spiral and the dissymmetry of the filament mounting, there is considerable irregularity in the distribution of the light about the vertical axis. Consequently, when the lamp is rotated, as is commonly done in rating lamps at the factory, the light as seen in the photometer flickers so excessively as to render accurate measurements of candlepower practically impossible without the use of auxiliary apparatus. However, as is sometimes done, if two mirrors inclined to each other be placed back of the lamp, the flickering is so much reduced as to permit accurate candlepower measurements even at very low speeds of rotation.

But this expedient does not eliminate the most serious trouble caused by rotation. It was found that at constant voltage both the current consumed and the candlepower are different when the lamp is rotating than when it is stationary, the current changing in one direction and the candlepower always in the opposite direction; that is, there is a change in the operating efficiency of the lamp. Furthermore, this change in efficiency may be either positive or negative, depending upon the speed, and it is about twice as great when the lamp is rotating tip up as when it is tip down.

Fortunately, from the standpoint of photometry, there is for each lamp in either position a particular speed at which the current and the candlepower have the same values, respectively, as when the lamp is stationary. Hence, with the lamp rotating at this speed, its candlepower can be measured with accuracy in spite of its rotation. The speed for the above condition is practically the same for all lamps having the same number of loops in the filament; but, for lamps having different forms of filament mounting, it varies from lamp to lamp, being greatest for those having the smallest number of loops in the filament.

If the above precaution as to speed adjustment is not observed and lamps are rated while rotating at speeds ordinarily used in photometering vacuum lamps, the errors which enter may amount to as much as 1 to 2 per cent in current, or watts, in one direction, and as much as 15 to 20 per cent in candlepower in the opposite direction. Hence, the voltage found for a desired operating efficiency may be so much in error as to give a lamp on test at this rated voltage a fictitious life value three or four times as large as the lamp would give if it were operated stationary at a voltage corresponding to that efficiency which during the rating was only apparent. That is, the lamp may be given credit for a much longer life than it really deserves. On the other hand, the speed may be such as to cause errors in the opposite direction resulting in a lamp life much shorter than would be expected from the apparent efficiency rating.

Another peculiarity of the gas-filled lamp is that while it burns the blackening occurs, not all over the bulb in approximate proportion to the light distribution as in the vacuum lamp, but principally at the top of the bulb, because the volatilized material is carried upward by the gas. Hence, in making a life test, a true measure of the reduction in total light during the life of the lamp cannot be obtained, in the usual manner, by mean-horizontal-candlepower measurements, but by determinations of the total flux or mean spherical candlepower. This is accomplished most rapidly and conveniently by means of an integrating photometer, such as the Ulbricht sphere, in which the lamp is measured stationary, and thus all the complications arising from rotation are entirely avoided.

As to the cause of the variations observed in candlepower and efficiency when the lamp is rotated, it is concluded from the results of a number of special tests that the whole effect is produced by a change in the convection currents of the gas, a consequent variation in the temperature distribution in the bulb, resulting in a change in the resistance, and therefore a variation in the current and candlepower of the lamp.

Inclusions in the Silver Voltameter Deposits.

The results of a careful series of measurements to determine the amount of impurity contained in deposits of silver made in the silver voltameter have just been published by the Bureau of Standards, Department of Commerce, in its Scientific Paper No. 271.

The silver voltameter is the international standard for the precise measurement of electrical current. The importance of measuring the inclusions arises partly from its use as a primary standard and partly because it is important from an electrochemical standpoint to determine what difference there is between the value for the electrochemical equivalent of silver as defined for the purposes of electrical measurement and the absolute value. The present work indicates that under the best conditions the impurities in the silver deposits are about four thousandths of one per cent. The results of this work permit a correction to the value of the faraday, which is an important constant in physical chemistry and certain branches of theoretical physics.

Copies of the publication, entitled "Inclusions in the Silver Voltameter Deposits," will be sent free to persons interested upon request to the Bureau of Standards, Washington, D. C.

Electricity in the Manufacture of Silk

A Description of the Process of Manufacture in a Typical Mill with Data on a Number of Plants in Easton, Pa., Purchasing Power from the Local Utility

Industrial Power Series—Article No. 161

The manufacture of silk, while a simple manufacturing operation, is very interesting and a most important industry from a central-station standpoint.

The largest number of silk mills are in the vicinity of Easton, Allentown, Scranton and Wilkes-Barre, Pa., and Paterson, N. J., where a good supply of female labor exists, and also near the large silk market to be found in New York City.

Most of the raw product comes from China, Japan and Italy, and the preliminary operations after taking the silk from the cocoon is done by very cheap labor and by hand in those countries. Unwinding the silk, the ends or fine fibers are taken up and twisted or joined together to make continuous threads which are formed into skeins, baled and shipped to the mills. Although the best quality of silk is produced in Italy, the supply is not as great as that of China and Japan. The single threads are twisted about 1.5 to 3.5 turns per inch and comprise from two to six ends as they are termed, depending on the grade of the finished product.

Process of Manufacture.

Before the silk is sent to the throwster it is immersed into a bath of soap and oil to soften the fiber and wash the impurities. It is then dried and taken to the "swifts," and run on the bobbins. These "swifts" comprise a hexagonal frame with six wooden pegs on which the skein of silk is placed. From the "swift" the silk now on the bobbin is placed on a vertical spinner, which is known as the first-time spinner, and is spun at 8,000 to 12,000 revolutions.

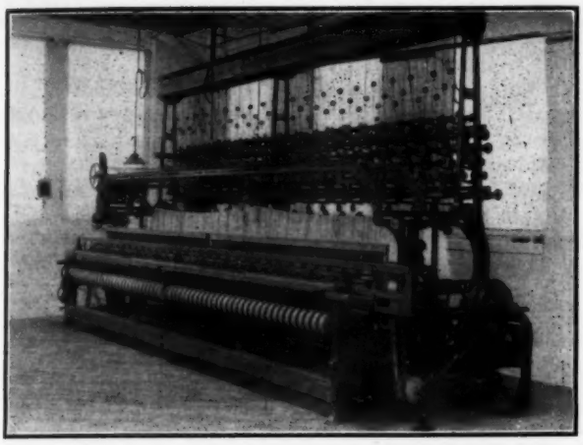
After this operation is complete the bobbins are taken to the "doubling machines." Here two more threads are put together; this operation simply winds the threads together. The silk is then taken to the twisters, or second-time spinners, and the machines are similar to the first-time spinners, but are equipped with what is known as "flyers." The "flyer" is a piece of steel wire attached to a leather or wood washer on the spindle shaft. At the end of the wire which extends about four inches from the shaft is an eyelet through which the silk thread passes and is twisted about each other.

In this machine the silk is twisted for the various kinds of silk, and if it is being prepared for smooth plain silk, the flyers operate at 8,000 revolutions per minute, but if for crepe, will operate as high as 12,000 revolutions per minute. The high speed gives the silk a hard twist, and when woven into the cloth gives that crepe or irregular effect.

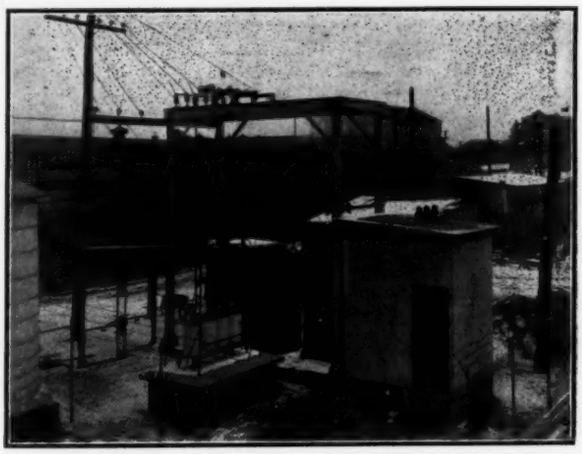
That part of the process above described is done in throwing mills which in turn send their product to the weaving mill, but there are many mills which carry on the complete manufacture from the raw silk to the finished product. Such a mill is shown in the accompanying illustrations.

After the silk is prepared in the throwing mill, it is taken to the looms and woven into the cloth or finished product. This is a most important operation, as defects in

Motor Drive in the Finishing Room of a Large Silk Mill at Easton, Pa.



Five-Horsepower Motor Driving Silk Loom Through Friction Clutch.



Substation of Stewart Silk Company, Easton, Pa., Using Central-Station Service.

the piece of silk as it comes from the loom are costly, the work requiring skilled weavers.

The silk is placed on reelers, a machine which looks much like a ferris wheel, and here the threads are laid in parallel lays. This is the foundation upon which the loom operates. It is then placed on the loom where every other thread in the lay is worked up and down and the bobbin or shuttle is thrown through the lays. After each time the shuttle passes across the loom a frame comes forward and lays or packs the thread from the shuttle solid in place, which is the final machine operation.

Power Requirements.

From a central-station standpoint, silk mills are a most desirable business. The mills vary in size from a 20-horsepower connected load to 1,000 horsepower, and the load-factors run high in proportion to the demand as will be seen by referring to the tabulation.

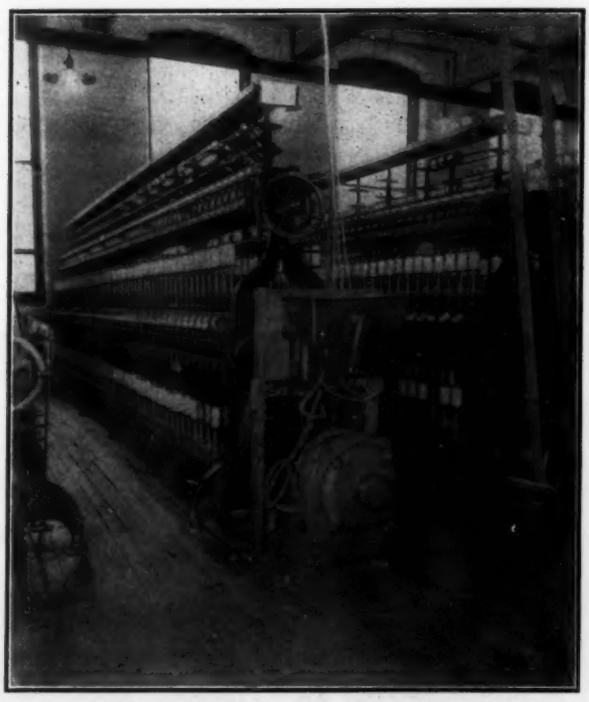
The mills are often spoken of as either "throwing mill" or "weaving mill." The throwing mill only prepares the silk for the weaving mill, and from the foregoing description of the process it can be readily seen what part each mill plays in the operation.

Mill.	Preparation.	Horsepower Connected.	1-Hour Demand, Kilowatts.	Average Monthly Kilowatt-hours.	Load-Factor.
A	Throwing	70	44.5	24,551	75.5
B	Weaving	25	11.1	2,927	36.5
C	Throwing and Weaving	65½	62.36	11,610	25.5
D	Weaving	44½	35.7	15,520	59.6
E	Throwing and Weaving	700	443.0	141,715	43.8
F	Weaving	35	15.6	2,934	25.8*

*Half the number of looms.

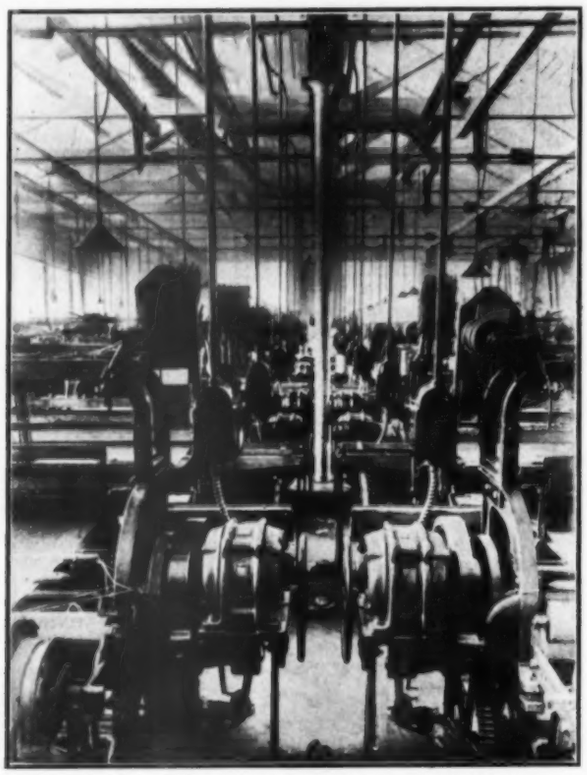
It can be seen that motors in a silk mill operate to capacity. A test on one 20-horsepower motor, chain drive to shaft, equipped with roller bearings, driving ten 106-spindle frames on first-time work, at 10,200 revolutions per minute, eight frames being operated at the time of test, showed a motor input of 20.6 horsepower or an average of 2.44 horsepower per 100 spindles, and with nine frames operating 25.7 horsepower or 2.69 horsepower per 100 spindles.

On second-time work a test made on one 10-horsepower



Group of Spinning Frames in Silk Mill Driven by Individual Motors.

Ribbon Loom Driven by 4.5-Horsepower Motor Through Centrifugal Clutch.



Dobby Loom in Easton Silk Mill Driven by 4.5-Horsepower Motor.

motor, chain drive to shaft, equipped with roller bearings, driving six 86-spindle frames, at 8,500 revolutions per minute, showed a motor input of 11.5 horsepower or 2.22 horsepower per 100 spindles.

The machines in throwing mills are compact and can be placed in a relatively small space and their high speed permits the use of high-speed motors.

During the recent years of rapid development of central-station generating and transmission equipment, silk mills have changed from steam drive to purchased power. One important reason has been the uniform speed that motor drive maintains, and the reasonable cost for power. Uniform speed in silk mills is important as it reduces the "voids" or imperfections in the finished product; it being a very expensive article of commerce it can be readily seen to lose even a small percentage of production due to such imperfections increases the cost of manufacture.

In one very large mill purchasing central-station energy at 11,000 volts, doing its own transforming, the entire plant is equipped with graphic frequency meters, graphic watt meters and graphic volt meters, so it can be readily seen that the silk manufacturer keeps a very close check on the regulation of his source of power.

Many mills are coming to chain drive on line-shaft drive, reducing slip and increasing the efficiency, and results have proven that this form of drive is very satisfactory. Individual drive is also extensively used, and is to be preferred, and chain drive is also coming into common practice in place of cut gears.

Wireless Achievements at Tufts College in Massachusetts.

The transmission of music by wireless with a small amount of power, giving a range of more than 100 miles, so that ships at sea have picked up tunes, has been brought about at the station of the American Radio & Research Corporation, at Tufts College, Mass., of which Harold J. Power is general manager. The mere fact of sending music to the distance mentioned is not in itself a remarkable feat, but by means of a novel method of introducing the sounds in the radiated waves, resulting in articulation and loudness in the waves received, a marked gain has been achieved.

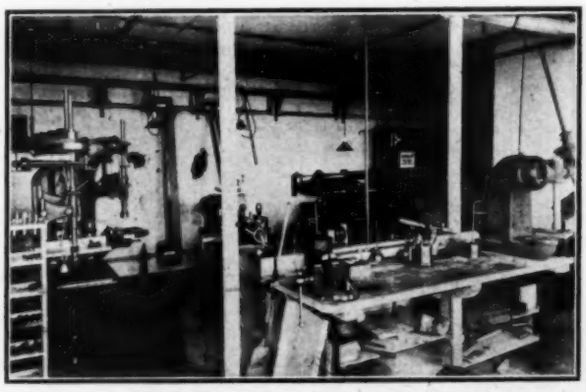
To provide the high-frequency current necessary Professor Power employed an oscillion bulb, the invention of Lee De Forest, of New York.

It is recognized that there are two important factors in the successful transmission of wireless telephone messages. One is the generating of high-frequency currents and the other its modulation in accordance with the voice or the music to be transmitted. It is the latter of these two problems that Professor Power is especially interested in, because the De Forest oscillion is recognized as a perfect means of generating the needed high-frequency current. It has been possible for some time to obtain sufficient power to transmit telephone messages to any distance, but how to introduce the voice at high-power stations in a practical manner, is the great problem of radio telephony, and to this branch of work Professor Power is now devoting much attention. His device for introducing the voice is far from perfected as yet, but successful results have been obtained, from reports thus far received.

Operators at several stations on Cape Cod have reported recording the strains of well known popular airs produced by a phonograph, and in two instances steamers entering Boston reported picking up the music more than 100 miles out from port.

The radio station's equipment is one of the most complete in the country. Students in Tufts College have the facilities at their disposal for experimental work, though the plant is owned by a private corporation. A number of valuable results have been developed by members of the Tufts Wireless Club.

Experimental Room of Wireless Station at Tufts College.



Corner of Machine Shop at Tufts Wireless Station.

COMMERCIAL PRACTICE

New-Business Methods, Policies, Rates and Kindred Central-Station Matters for the Man Engaged in Selling Electricity

Effective Color-Tab System for Light and Power Records.

A simple and effective card contract record with color-tab key system has been devised by the Consumers Electric Light & Power Company, New Orleans, La. This system presents a means of valuable service and assistance for complete and immediate reference to current or past business, affording the particular information necessary to handle any condition that may arise in the course of the day's work. Through a simple symbolic card clip, one is able to trace in systematic form the history of any customer's relations with the company, character of service rendered, installation and operating data, and the like.

A card contract form has been adopted for all classes of electric service; these cards are 4 by 6 inches and carry concrete particulars of different features of the agreement between company and consumer, while the reverse side sets forth the various rules and regulations of the contract. The cards are filed in accordance with city location, viz.: alphabetically under street name and corresponding street number. They are of three different colors —white for regular residence service; blue for electric energy to be supplied to business establishments; and yellow for general contracts for electric power for manufacturing plants.

Each salesman has his particular city territory, and is identified in the office files by a color tab-clip which is used in connection with the contract card. These tabs are blue, red, green, yellow, etc., and, attached to the card

RED COLOR CLIP-IN THIS POSITION MEANS PERMANENT SERVICE. COLOR INDICATES A CERTAIN SALESMAN
YELLOW COLOR CLIP-IN THIS POSITION MEANS TEMPORARY SERVICE. COLOR INDICATES A CERTAIN SALESMAN
APPLICATION FOR ELECTRIC SERVICE.

Fig. 1.—Contract Card Showing Application of Color Tabs.

as shown in Fig. 1, are readily located in the file at a glance. Thus the name of the salesman securing the business is always available without necessity for further reference.

The position of the tab-clip on the card also carries a certain significance relating to existing conditions of electric service. The city ordinance provides that electric installations may be effected and continued in service temporarily for three months, during which time an official inspection must be made before final approval for continued service is granted. The salesman's clip on the right hand side of the card indicates the first condition—that temporary service is operative; when final permission is given for permanent service, the clip is transferred to the left side, completing the contract and installation record.

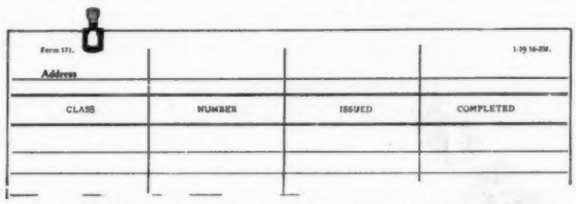


Fig. 2.—Card for Customers' Data With Color Tab Attached.

When electric service has been discontinued for any cause, these particular contract cards, kept in the same file with the operative accounts, are designated with master clip-tabs of different colors, which give the necessary discontinuance data. These clips are attached to the center of the cards and automatically describe conditions along the following lines: Yellow shows that the house or establishment is now vacant; blue, that the customer is using gas; pink, that the consumer is now using competitive electric service; and plain double clips, that service has been discontinued through non-payment of bill. The colors on the tabs are arranged of varying shades so as not to conflict in any way with those employed for the salesmen.

In connection with this contract record file, a duplicate card system, with cards 6 by 9 inches, ruled both sides, is used for the operating department. This card covers the following data: Occupant of house or establishment, installation, meter number, size, type, constant, transformer number, size of transformer, on one side, and on the other: class of service, house number, order issued, and order completed. These are filed alphabetically in accord with street name and number, and each such card represents a contract in the contract file.

When a contract is signed and required meter deposit made, it is turned over by the commercial manager to a record clerk, who makes out the large card with the necessary information for the operating department. This card upon filing is affixed with three clip-tabs, indicating that the final contract is pending, subject to official approval of installation by the city. These tabs of different colors show the period of the monthly terms that final connection is contingent upon the city authority. For the first two weeks of the first month, the card carries three blue tabs, for the second two weeks, three yellow tabs, and so on.

As soon as the necessary permit is received, and the meter and service orders issued, two of the tabs are removed from the card. When such office orders are returned completed, the remaining tab is taken off and the

card marked with the date of completion of order, etc. This card form, with clip tab, is shown in Fig. 2.

The simplicity and value of this color-tab system is at once apparent. Its distinguishing features render immediately available all necessary data for the prompt conduct of business, and without any searching through miscellaneous mass of records. The commercial and operating departments are linked together with a sure and positive identification system for the avoidance of errors, and one which can be readily handled and kept up to date by record clerks, devoting their time exclusively to this work and becoming thoroughly familiar with its various functions. A glance through the files at any time affords the company officials a concrete guide to these important features of the business.

Unit Wiring Prices in Gardner House-Wiring Campaign.

Unit prices for wiring, in both old and new houses, were agreed upon between the central-station company and local contractors as a preliminary to a house-wiring campaign now being conducted by the Gardner (Mass.) Electric Light Company. Wiring prices in old houses are:

1 outlet	$ 5.00	6 outlets	$17.00
2 outlets	9.00	7 outlets	18.00
3 outlets	12.00	8 outlets	19.00
4 outlets	15.00	9 outlets	20.00
5 outlets	16.00	10 outlets	22.50

Between 10 and 20 outlets $2.25 each; over 20, $2.00 each.

Hardwood floors	$2.00	Cutouts	$0.40
Pipe entrance	5.00	Snap switch	.25
Ground wire, per ft.	.10	Flush switch	1.00
Ground pipe, per ft.	.06	Flush switch, 3-way	1.75
Entrance switch	1.00		

Figure two wiring outlets to cover 3-way switches.

Pipe-entrance charge covers cutouts and entrance switch.

Open wiring in basement is figured as inclosed work in house.

Rates for fixtures in houses already wired are:

Ceiling plates	$0.10	Ground wire, per ft.	$0.10
Wall case, plus switch	.25	Cutouts	.40
Snap switch, no case	.25	Main switch	1.00
Pipe entrance	5.00	Ground pipe, per ft.	.06

Figure on ground pipe from shutoff to rafters.

Figure 35 cents per fixture for hanging, including cords.

Figure in plates on all fixtures with canopies.

Fixtures to be reckoned at schedule prices.

Prices for new work are on the following basis:

First 20 outlets	each	$1.25
20 to 30 outlets	each	1.20
30 to 40 outlets	each	1.15
40 to 50 outlets	each	1.10
Pipe entrance		5.00
Cutouts		.40
Entrance switch		1.00

Ground wire and pipe are figured 10 cents and 6 cents per foot, respectively.

Customers make an initial payment equal to 20 per cent of the cost, the remainder being paid in 6 monthly instalments. The company has thus far secured 15 contracts, 26 meters, amounting to a little over $1,000.

Campaign for Inducing Customers to Solicit Business.

As an inducement to present customers to persuade their neighbors to talk electricity to their friends who have unwired houses, the Texas Power & Light Company is offering, during Wire-Your-Home Month, an electric iron free to any customer who will secure a wiring contract for an existing unwired house on the company's lines.

Only one advertisement had been run at the time this was written, yet many inquiries had been received in reference to the offer. The first two ads in the campaign are reproduced herewith.

An Electric Iron Free
March 27—April 24
During the month of March 27 to April 24, which is known Nationally as "House-Wiring Month," we will give FREE to any of our present customers who induces a friend to wire their house, a guaranteed, 6-lb. nickeled, electric iron.
This iron will be given for contracts secured for wiring houses on our present lines only.
Here's a chance to get an electric iron FREE.
Persuade Your Friends To Use Electric Lights
March 27—April 24
You who know all the advantages of electric light will find it an easy matter to persuade your friend or neighbor to have her house wired.
Simply get her consent to wire the house and we will send a man out to give her figures on the job. When the house is wired we will give you the iron FREE.
Now is the time to get an electric iron for only a few minutes' work
"Service First" TEXAS POWER & LIGHT COMPANY "Service First" No. 24

Will YOU Get A Free Iron
House Wiring Month March 27—April 24th
You should start now if you are going to take advantage of our offer to give FREE to any of our customers a guaranteed 6-lb. electric iron. This FREE iron will be given to any customer who will induce a friend to have their house wired.
Given To Any Customer Who Will Induce A Friend To Wire Their Home
House Wiring Month March 27—April 24th
The house to be wired must be on our present lines. No extensions will be made on this offer.
You are familiar with the benefits of electric lights and it should be an easy matter for you to convince your friends that this is the best way to light their homes.
GET BUSY TODAY
"Service First" TEXAS POWER & LIGHT COMPANY "Service First" No. 24

First Two Advertisements of a Series Published by the Texas Power & Light Company Offering Premium to Customers Inducing a Friend to Wire for Electricity.

POWER ENGINEERING

Problems Involving Motor Applications, Machine Characteristics, Power Sales Methods and Industrial Electric Heating

TALKING POINTS FOR CENTRAL-STATION POWER.

By J. H. Schakne.

Electrical drive for industrial establishments of all kinds has so many advantages over other methods of applying power that manufacturers who give careful attention to its merits usually decide in its favor. To operate with the greatest degree of economy, necessitates the use of electric motors to drive all types of machinery. This point being decided, the prospect must install either an isolated plant for generating electricity or purchase service from the central station in the vicinity. A hasty consideration of the condition often leads to a decision which is regretted afterward. The results of a wrong decision have sometimes proved so disappointing that expensive changes had to be made, which might easily have been avoided if the various elements of the problem had been more carefully considered originally.

Sometimes a manufacturer feels reluctant to make a change from a power plant of his own to another not his own, and a long distance away. But an analysis of the situation shows that even in his own plant the responsibility for power supply rests with his engineer as in the central station plant it rests with the central-station engineer. In either case, he must depend upon someone else, and his real control over the reliability of the power supply is no more remote in the latter case than in the former. The daily records of service will prove that the central station is more reliable. The central station's reason for existence is to sell power and if power is off when demanded, it not only loses money, but also injures its reputation, and its chances for securing additional customers.

In laying out a new plant or in calculating the electric power required to operate machines in an existing plant, an error common to those unfamiliar with the application of motors to machines is to overestimate the cost at central-station rates. The requirements of each machine should first be determined and the average requirement of the factory then found by multiplying the aggregate capacity of all the motors by a load-factor determined by experience with machines of similar characteristics in similar industries.

An isolated plant must have overload capacity at least enough to cover the maximum power requirements; to insure continuous service the plant must have enough duplicate equipment to allow part of it to remain idle in case of breakdown. In many cases some provision must also be made for future enlargement of factory with its consequent increased power requirement.

Very frequently when considering the installation of an isolated plant, the inclination is to overlook features of considerable importance. Below some of the points to be considered in determining the cost of present and future power are mentioned:

1. Cost of installation, including prime movers, generators, switchboards and auxiliary apparatus. If insurance against failure of power is required, spare machinery must be installed, that is, capital invested in machinery which will be idle, except in the case of an emergency.
2. Cost of floor space or land for power plant.
3. Cost of fuel and other supplies for operating the plant.
4. Cost of labor and superintendence.
5. Cost of repairs to all machinery.
6. Investment in repair parts.
7. Interest on all money invested on account of power plant.
8. Depreciation on value of buildings and apparatus.
9. Cost of delays in factory operation, owing to shortage of fuel, as just recently happened when the natural gas supply was shut off in many plants in Pittsburgh.
10. Cost of making changes in size of plants to keep pace with necessary factory changes.
11. Cost of operating the entire plant on account of overtime work on a few machines.

On the other hand, the central station makes a business of supplying a large number of diverse interests with electricity enough to take care of all overloads. The diversity-factor, by which we mean the absence of a demand for maximum power simultaneously by all of the diverse interests, enables the central station to operate with higher station load-factor than can the isolated plant. High station load-factor means low investment per unit output. Fuel and other supplies are contracted for by the central station in large quantities; the number of units installed is always enough to allow one or more to remain idle for repairs without crippling the service. A high class of labor is employed and the number of operators is sufficient to insure continuous operation.

After careful consideration of all phases of the problem, the decision, if made according to the evidence, must, with very few exceptions, be in favor of the central-station supply. The arguments in favor of this decision may be summed up as follows:

1. Smaller investment; no capital is tied up in plant equipment and supplies.
2. Reliability of supply.
3. An accident to any one machine localizes the trouble without affecting other parts of the plant.
4. Availability of supply at "all" times and cost of power always in proportion to the amount of work to be done.
5. Ample overload capacity.
6. Good voltage regulation.
7. Freedom to locate factory anywhere and to relocate at any time without reference to power supply.
8. Ability to enlarge factory capacity at any time without expensive changes in the power plant.
9. Decreased insurance rates, owing to decreasing fire hazard.
10. Absence of all noise, heat, dirt and smoke incident to a power plant in a factory building.
11. Ability to work overtime with power charge only in proportion to the work done.

Talks to Central-Station Power Salesmen

By C. H. Stevens
Manager, Power Engineering Bureau, Brooklyn Edison Company

This is the third of a series of articles by Mr. Stevens in which he discusses the salient features of power-sales work. This installment deals with the various fixed charges on an isolated generating plant, showing how these charges affect the unit cost of power. Another article by Mr. Stevens will appear in an early issue.

In the preceding article reference was made to the analysis which must be made of the heating requirements of a plant to be changed over to central-station service and to the fuel requirements under isolated-plant operation and when using purchased power.

Initial Cost of Equipment.

If the proposition be one where a new building is to be erected and it is a question of a private plant or central-station service, the initial cost of the equipment is a matter which should receive very careful consideration. It very often happens that the customer's first estimates are based on an elaborate basis, and such as would operate at the highest efficiency. The prices on this equipment must necessarily be high, and the boiler evaporation and steam consumption of the engines, water rates, etc., are such as would give the best results obtainable. However, as soon as competition becomes keen between the other manufacturers of plant apparatus and when the central-station company gets into the field the customer finds that the fixed charges on such an equipment amount to a great deal of money and he gradually cuts down the cost of this equipment and therefore the quality. But, in such instances he very seldom considers that as soon as he cuts down the cost of his apparatus, the efficiency of the same must necessarily go down in proportion. In other words, the manufacturer may originally figure on a 500-horsepower plant consisting of water-tube boilers with superheaters and automatic stokers, compound condensing engines, economizers, etc., and on such an equipment receive certain estimates on the number of pounds of steam to produce a horsepower-hour. He gradually cuts down on this equipment until he is receiving estimates on a plant which may consist of boilers without superheaters and high-speed simple non-condensing engines. The price of this original plant was $80,000 and his estimate on steam consumption was 16 pounds per horsepower. He has now brought the cost of the equipment down to perhaps $40,000, but the chances are more than ever that he has not taken into consideration that while the price of equipment has been going down the steam consumption has been going up in proportion. It is part of the power salesman's job to show him that he has increased his steam consumption 100 per cent while he has been reducing his initial cost.

Fixed Charges.

Interest, Depreciation, Taxes and Insurance.—Under this heading both the private plant advocates and the central-station salesman will usually agree that a value should be given to each item. However, there is usually considerable divergence of opinion as to the percentage of total plant investment each should bear. It is of course highly essential these be given true values and every argument must be used to convince the prospects of the plausibility of the values assigned.

Interest, Taxes and Insurance.—The bearing which the items taxes and insurance have on the proposition are of course dependent entirely on the initial cost of the plant and the local tax and insurance rates. Ordinarily the rates covering boiler, liability and fire insurance will amount to two per cent of the plant valuation. The current tax rates, together with the scale of valuations, can be obtained from local civic authorities.

Interest on investment of course depends on the local money market and the credit of those considering the installation of the plant, five per cent being a common rate in the east. These three items frequently total more than eight per cent of the plant valuation, and represent an expenditure which is largly eliminated if power is purchased from an outside source.

Fair Profit.

In connection with the plant investment there is not only interest, depreciation and taxes to be considered in the fixed charges, but there is very often another item which is sometimes overlooked, and which, in many plants, has an important bearing upon the yearly cost.

This item of "Fair Profit" represents value of capital over the normal or banking rate of interest to a growing concern if invested directly in the business itself. For instance, a growing manufacturer may be making 20 per cent on the money invested directly in the business operations. Owing to its rapid expansion, he may have urgent need of all the capital that he can raise. If this same manufacturer should invest $50,000 in a private plant at this time, when central-station service can be purchased at approximately the same cost per kilowatt-hour as the cost by private generation, he should not only charge five per cent interest in his yearly costs of making power, but he may properly charge off 15 per cent per year under the heading of "fair profit."

This manufacturer necessarily wishes to invest every dollar he has available in that part of his business which is lucrative. The power plant is only a means to generate power and not a necessary means if central-station power is available at reasonable rates. The money invested in it is fixed, and bankers regard it as a poor basis of credit as it is not quickly negotiable. Also, as such investment charges are fixed, they have a greater effect upon the cost per unit on the yearly output than most any other element entering into the cost of production.

The ratio of investment between private generating plant and equipment for operating on central-station energy is roughly seven to one. Hence, if central-station service is used, six-sevenths of the capital, which might be tied up in fixed investment, is available as working capital, on which a reasonable percentage of profit may be earned.

Depreciation and Obsolescence.

The life of any plant is dependent not so much by when it bcomes physically useless as by when it becomes obsolete, at which time it should be replaced by a more effective and economical source of power. Therefore, not only depreciation but also obsolescence must always be taken into consideration. This is usually a bone of contention, and care must be taken to impress upon the prospective customers its true weight. Users of internal-combustion engine plants will usually give a fair value to this item, but its importance is apt to be overlooked by the users of steam-driven plants.

It is common practice for a manufacturer to allow five per cent of the total cost of investment to this item of

"depreciation and obsolescence," and at the end of a few years he may entirely discontinue making any charge. Ten per cent is a fair figure to allow for interest and depreciation, especially when we consider the rapid strides made in the past ten years in boiler and prime movers, and the modern prospective manufacturer will usually accept this as being a fair and conservative figure.

Operating Costs.

Under operating expenses stress may be laid on the fact that the cost of labor and fuel have constantly increased for several years, and that under most favorable conditions no decrease may be expected, while central-station rates for energy have very materially decreased in the past few years, and it is only reasonable to suppose they will continue to do so. This point may be borne out by a comparison of curves showing the increased cost of fuel, the increased cost of labor, and the decreased cost of central-station service covering a period say of ten years.

Executive Attention.

Plant supervision or executive attention is very frequently overlooked, and still it has a direct bearing and a certain value which should be considered as part of the labor cost.

The manufacturer and his staff should direct all their attention to making and marketing their product and should not have to devote valuable time in the supervision of a power plant. This is a responsibility, and a serious one, that is assumed through the installation of a private generating apparatus. The executive's time has a definite value and due charge should be made against the operation of the private plant for such of his and his assistants' time as it requires. This does not necessarily mean that the salaries of these individuals would be decreased if central-station service is adapted, but their time would be devoted to other branches of the business where it would be of more direct value in producing profit.

When central-station service is adopted this responsibility is placed with others who are highly specialized in this particular work and whose business and future is based upon their capacity for rendering a reliable and constant supply of power.

This is an age of specialization. If one wants the best service of any kind, he goes to the specialist. The same applies to users of power. If they wish a reliable, constant and cheap power, it should be purchased, if possible, from those who have specialized in that particular line.

Value of Space Occupied by Plant.

In bringing to the manufacturer's attention the true cost of installing and operating a private plant, there is the cost of creating space and value of space to be occupied by the private plant. Many times the plant is located below the regular basement of the building, and therefore this space is the most expensive to create. In some localities the space which a plant would occupy is of great value, so great in fact as to almost preclude its installation, but in all instances the space occupied should be duly considered. The housing of a plant has a definite value and in most cases could very profitably be used for business purposes.

It is hoped the foregoing superficial treatment of a very broad subject, each sub-head of which would require much space to properly treat, will bring out some points which will be of help to those engaged in selling power. There are many other arguments which can be used and advantages in favor of central-station pointed out; such as, ability to increase factory capacity at any time without extensive changes in the power plant; availability of power supply at all times and cost of power proportional to work done; ample overload capacity without additional investment on the part of the manufacturer; absence of the fire hazard and of vibration, noise, smoke, heat and dirt occasioned by a power plant, etc.

HOW ONE CRACKER BAKERY TURNED TO ELECTRIC DRIVE.

Many Advantages of Central-Station Service Demonstrated When Steam Plant Was Destroyed by Fire.

One of the model cracker bakery plants of the country is the new plant of the Grocers' Biscuit Company, Louisville, Ky., where every wheel that turns is turned electrically. Aside from the fact that there are some interesting points which can be made in connection with this particular power sale, the statement is important in another way. All that is necessary to substantiate such an assertion is to quote from John J. Jacklon, superintendent of the plant, who stated:

"Out of a thousand or so first-class cracker bakery establishments in the United States, probably 800 of them are still run by steam."

This fact alone is enough to make the proposition something that the power salesman should look into. Undoubtedly those 800 remaining plants are located where they are available prospects for "converting" if the central-station missionaries would go out and seek them.

A cracker bakery, it may be said, is a specialized proposition. It turns out a product or a variety of products different from bread. It works in sponges more extensively than in doughs; it turns out small cakes, cookies, snaps of one type or another, soda crackers and oyster crackers, cracker dust, etc. Sweet goods constitute rather an important part of the output. Except for this, however, its machinery, oven, heating and similar requirements are not greatly different from those of a bread bakery. An engineer who is familiar with operations in one, would be able to handle them in another without a great deal of study.

The Grocers' Biscuit Company plant in Louisville was ten years old when fire practically wiped it out. It had been from the outset steam operated, probably for the reason that when it was equipped electrical progress had not reached the stage where power salesmen were especially active in closing contracts. From time to time, however, as the years passed, representatives of the Louisville Gas & Electric Company, or its predecessors, had gone over the ground with the superintendent of the plant and had made proposals for its electrification to the owners.

Now, as most power salesmen know, a bakery is a rather difficult proposition for conversion when there is nothing happening to bring matters to conclusions. Any bakery plant which operates with power requires steam for various purposes. In the winter the plant has to be heated; in some of the processes it is customary to spray the product with steam while it is in the ovens; steam is required or at least most used to heat water, of which large quantities are used in a plant like the Grocers' Biscuit Company. In addition steam serves better than most other means for cooking of the icings which are extensively used, the syrups and the fillings and the jellies. Many of the larger establishments make their own flavorings and steam is useful there.

So where a plant is equipped and operating, engine installed and shafting and coupling up and running and the whole establishment organized on a steam-driven basis, the first cost of changing over to electricity has been a stumbling block for many a power salesman. That was what it proved for the power salesmen of the Louisville company in this case. However, the management was very much in favor of electricity, was convinced, as it were, of the greater desirability of that character of power, but balked at the first cost of making the transition.

Files of the Louisville company show that a number of separate propositions had been made for changing the

system over. Interviews with Mr. Jacklon and officials of the company disclosed that the company was fully aware of the disadvantages of the old-style method of operating with steam. However, it was at length determined to continue on the existing basis for the present, although it may be observed that the objectionable features continued to make themselves noticed.

And this is a point which is worth consideration and following up where the power salesman has once figured and specified an electrification of a job. Once he has dilated on the superior merits of the electric drive, its absolute cleanliness, economy, convenience, dependability, etc., and compared these points with conditions as they are, he can go away and be sure that the old equipment will keep on working in his interest. In a cracker factory, for instance, every time a belt broke and fell into a broad ribbon of dough, destroying it for normal uses, everybody around would have an object lesson in the advantages of electrical drive. Every time some man's shirt sleeve caught on a pulley set screw and broke an arm, every time the engine failed, every time an overhead oil cup dripped on a tray of finished goods, every time any of the various minor casualties which are always happening in a steam power plant occurred, electricity would get the benefit.

This was the situation at the plant of the Grocers' Biscuit Company when the fire destroyed it. This is not to say, and it would not be fair to say, that things had to wait on that fire. In fact, it is morally certain that electricity would have prevailed anyway in due course. But the fire did come and the answer to the fire was the new plant and its electric drive equipment. After the fire the Gas & Electric Company salesman, A. S. Witmer, who handled the transaction, did not have much to do but to go down and sign the contract. He had already done the selling.

The company fitted out a temporary plant adjoining the sister plant, the Grocers' Baking Company, and equipped it electrically. Then it set to work on rebuilding the old plant. It was made larger and provision was made for expansion later on, and the plans specified electricity all the way through. If it had needed anything to convert the company to electricity the experience in the temporary plant would have done it.

Nor was the proposition altogether one sided. One of the pieces of equipment left from the fire without suffering any particular damage was an almost new 200-horsepower Corliss engine, which is still on hand and being taken care of, so that it could be put into service if it should prove necessary. Another part of the equipment includes two 100-horsepower boilers. It is obvious that these constitute the nucleus of an isolated power plant. In all probability, if such a plant were to have been installed, it would have been an isolated electrical plant, but the fact remains that the equipment, apart from the electrical installation, is on hand ready to use.

The boilers are used alternately and in the winter months operate nearly to capacity for the uses of steam which have been mentioned. In the summer months, however, a 30-pound pressure is sufficient to take care of the demands of the plant. This, of course, is an advantage in favor of the central-station service, although not as great as might be anticipated. In the winter no more fuel would be required to operate the engine than is now required to keep up a sufficient head of steam. It would take from 70 to 80 pounds of pressure to operate the engine, it is stated. This is more or less incidental, however, and probably would be offset by the cost of employing an engineer and fireman under normal circumstances.

The connected load of the Grocers' Biscuit Company is 174 horsepower and there are altogether 23 motors, ranging in horsepower from 3 to 20. It is a unit drive proposition throughout, with the exception of a few icing beaters which are in constant use and which are grouped and driven by a five-horsepower motor.

Several of the motors, it may be noted, are incidentally, over-size. For instance, two cake mixers of equal capacity stand side by side. One is operated by a five-horsepower motor and its twin by a 7.5-horsepower motor. The purpose is to provide a sufficient amount of power to take care of a very stiff batter, which uniformly goes into the more powerful mixer. In several other cases, at the suggestion of Mr. Jacklon, oversize motors have been installed, he preferring to operate with a cool motor below capacity than with a heating one nearly or at full capacity. All the motors are three-phase, variable-speed, which is in several cases further controlled by additional attachments.

Mr. Jacklon is a strong booster for electric power and for the unit drive. He stated to the representative of the ELECTRICAL REVIEW and WESTERN ELECTRICIAN that he would be glad to have any central-station power salesman refer a prospective baker to him. And the power man may be sure that he will give the electric drive a good "character." He enumerated some of the reasons why he preferred the electric drive, from the operating angle alone, unit drive being considered.

They included safety gained by the absence of belting, set screws and shafting, the motors in this case being uniformly direct-connected. Gain in cleanliness—belting accumulates dust, shafting means grease and oil, generally overhead, and thus likely to fall into the dough. Dependability—with the steam equipment something was frequently going wrong. Belts broke, the engine slowed up under low heads of steam and there was loss of time. Uniformity of speed—under the old system there was frequent variation in the speed, according to the load put on the engine. Suppose a batch of cakes were going through the icing process. Passing through the vessel of icing with the steam drive they accumulated more icing than desirable when the speed slackened.

From the economical standpoint there is the usual long list of advantages to be cited in favor of electricity. Detailed figures are not available, but it is stated at the plant without hesitation that the unit cost of production on any basis whatever is lower under the present system of operation than was the case before. In the first place it used to be necessary, under the old regime, to keep an engineer on duty all night long in order that he could get up steam for the sponges at 3 o'clock in the morning. Now the night watchman keeps up the small amount of steam required without trouble.

Cost of Electric-Truck Operation.

The accompanying figures on the cost of operating an industrial electric truck were presented by C. E. Ogden, Cincinnati manager of the Walker Vehicle Company, at a recent meeting of new-business managers of Ohio companies:

	Per Day
Depreciation at 10 per cent	34 cents
Interest at 6 per cent	15 cents
Tire renewals	14 cents
Battery renewals, lead cells	40 cents
Battery renewals, nickel-iron cells	28 cents
Electric energy at 4 cents	20 cents
Repairs at $10 per year	4 cents

These figures were based on 300 days per year use of the truck. The electric industrial truck referred to in Mr. Ogden's paper is considered the successor to the hand truck, and has found a wide field of usefulness in railway terminals, on wharves and in many factories.

ELECTRICAL CONSTRUCTION

A Department Devoted to Problems Relating to the Installation, Operation and Maintenance of Electrical Equipment

WIRING ABOARD SHIP BY THE ONE-WIRE OR SHIP'S RETURN SYSTEM.

By George R. Strombom.[1]

The one-wire system of wiring aboard ship is commonly called "the ship's return" and is not a new system in the eyes of marine men, but is rather a traditional wiring system considered preferable to any other from an economical standpoint. In writing upon this subject, I particularly refer to the "tramp" variety of steamships from 1,500 to 2,500 registered tons and of British build, as I have not had experience enough with other foreign-built vessels to permit me writing of them. I have as yet to see the American-built vessel that has adopted this system, although I have heard of a few.

In construction which takes the form of rewiring, we use lead-covered wire as a rule. We need not depend on the sheathing as a conducting agent, as a good ground is generally available at all points with but few exceptions, and for that specific reason the hull has been selected to perform the function of a return conductor which, in the other case, would fall to the sheathing. We do, however, in some instances, use the sheathing as a conductor, but that is the exception to the rule. Its chief function is to protect the insulated wire from water, although, from a mechanical standpoint, its protection is rather inferior compared to our ordinary conduit systems.

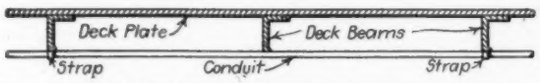


Fig. 1.—Run of Conduit Under Deck Beams With a Strap on Every Second Beam.

In some cases the wires are boxed in and this is considered sufficient protection, but in places such as the between decks and coal bunkers, I prefer to have them run in conduit. This is the safest way and as cheap, especially if it is a new run.

When running lead-covered wires we space our straps from six to eight inches, and when consideration is taken of the fact that the steel hull must be drilled and tapped for practically every strap, you will find it expedient to run a conduit line under the deck beams with a strap on every second or third beam, as shown in Fig. 1. This saves the drilling or burning of holes in the deck beams which would otherwise be required, as in Fig. 2, as it is neither permissible nor practical to loop the wires under the beams, as in Fig. 3.

The insulation of a single wire in this system is the same as for 110-volt circuits, and in adopting this system the total insulation is cut in half. Therefore, a 65-volt generator has been the standard machine used, the cut in voltage corresponding somewhat in the same proportion to the cut in insulation value.

These generators are not equipped with voltage regulators or rheostats, as there is generally only one machine on the ship, and this seldom exceeds its rated voltage and when it does it is governed by means of the throttle. Generally these ships are equipped with carbon-filament lamps and can withstand considerable excessive voltage. The positive terminal of the generator feeds the switchboard and the negative is permanently grounded, as shown in Fig. 4, to the hull.

Consider a load of twelve 32-candlepower carbon lamps.

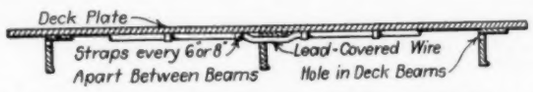


Fig. 2.—Method of Running Conduit Requiring Drilling of Holes in Deck Beams.

In our standard 110-volt system a No. 14 B. & S. wire would care for this load, but as a 32-candlepower lamp at 65 volts takes close to two amperes, we must allow a No. 10 B. & S. wire, leaving a margin of one ampere for rubber insulations and six amperes for other insulations. When a conductor with a greater carrying capacity than that of a No. 12 B. & S. is required, we use stranded wire. English contractors never use solid wires aboard ship. Solid wires are used for bell work, however.

In grounding this system each lamp, as shown in Fig. 5, has its own individual ground (with some exceptions) the object being to reduce the amount of wire used. This can be done in almost all cases as a good ground is generally always available. In cases where it is of advantage to have two or three lights on one ground this is done, but not otherwise, for, should the ground connection corrode off, which it often does, all lights on that ground would suffer, as in Fig. 6, and not only one, as would be the case in Fig. 5.

We experience great trouble in our efforts to keep these ground connections intact, as the moist ocean air and salt water take great pleasure in attacking them and oftentimes it does not take long before their victory is won. It is customary to red-lead and paint the ground connections, but it does not in any marked degree prevent corrosion.

In considering the possibility of short-circuits, it will be well to remember that in such places as the state-

Fig. 3.—This Method of Looping Wires Under Beams Not Permissible.

Fig. 4.—Negative Terminal Grounded to Hull.

rooms, chart room, pantry and wheel house, molding is often used, and in that event single-braid or preferably double-braid wire is used. It is a common occurrence for water, through one cause or another, to penetrate the molding and attack the insulation, the chief of these causes being leaky decks. Nine times out of ten it is salt water and it does not require any great length of time before the insulation is penetrated, opening a new and shorter path for the current to take. The greater the amount of

[1] Marine electrician, Hudson Navigation Company, New York, N. Y.

current passing through this new path, the dimmer the lights controlled or rather fed from that particular line.

It is obvious that the current passing through this path causes heat to develop, which will, if the current be heavy enough, finally char the insulation and molding, the danger of a fire being great. This is what might be called a

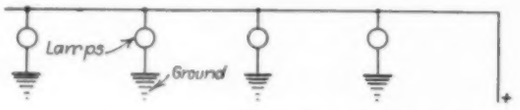


Fig. 5.—Individual Ground for Each Lamp.

leakage condition, as it is not a "dead short" and does not blow the fuse.

The only means we have of knowing when such a condition exists is by the dimmed condition of the light or lights, characteristic of that particular trouble. The dimmer the lights the greater is the advancement of this leakage condition. It is, therefore, advisable to use lead-covered wires at all times throughout the installation and reduce the chances of this condition to a minimum.

In places where the wires are subject to mechanical injury, they should be either boxed in or, better yet, run in a conduit, as the lead sheathing is easily punctured and short-circuits are generally the result.

I have often gone aboard a ship and found copper wire of no mean size substituted for the fuses, and when asking the reason for this practice, the invariable answer would be "The fuses blow out too often," which amounts to a case of "A poor excuse is better than none."

Considering the system as a whole, the best that can be said of it is that it is the simplest as far as construction goes, it has no complications and but one wire in the majority of cases to keep your mind on, as in ordinary cases, if no switch is required, the ground wire is but six or seven inches long, just long enough to enter into the fixture and grounds right alongside of the fixture block.

The system has not been adopted in this country as it is considered an unsatisfactory installation, is always full of small inconveniences, has ground connections frequently corroding off, current losses in cases of water-soaked molding and insulation or punctured lead sheathings, and therefore unsatisfactory lights, due to the cause mentioned above. The only redeeming features I can personally find with the system are its simplicity and the initial cost of installing is a trifle below that of our standard 110-volt system with conduit.

One might suggest that BXL cables be used to insure proper protection against mechanical injury to the lead sheath, but in that event it would prove just as economical to use conduit throughout, running only one wire in same, of course. Marine electricians have not proven themselves very anxious to work on these systems, as it is generally with a long face that they start off for one of these jobs (the writer, five or six years ago, being one of them).

I believe there is little fear of us losing our good old,

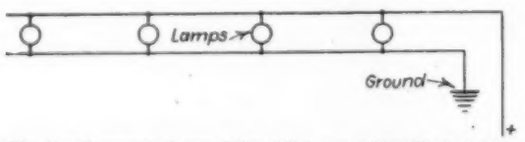


Fig. 6.—Common Ground for All Lamps Not Desirable in Ship Wiring.

tested 110-volt multiple system aboard ship. It has proven its worth and any ship that is fortunate enough to get a water-tight conduit system installed throughout, with the never-failing 110-volt, direct-current generating set, equipped with rheostats and with Mazda lamps in every socket, has a system that requires some going to beat.

Among the Contractors.

G. A. Hill & Brother, proprietors of the Electric Shop at Maysville, Ky., have sold their business to the Maysville Gas Company, G. A. Hill going to Detroit, Mich., and E. H. Hill to Springfield, O., where they will engage in the electrical business.

The Tuohey Company, Springfield, Mass., had an attractive electrical booth at the Good Homes Exposition held in that city. A large assortment of portable, bracket and hanging lamps and a number of domestic appliances were shown. The Eureka vacuum cleaner and electric washing machine were features.

The Olson-Boettger Electric Manufacturing Company, 200 West Third Street, St. Paul, Minn., reports that its present volume of business is taxing the company's facilities, and that the outlook for future business is very promising.

The Johnson Electric Company, Cincinnati, O., has obtained the contract for furnishing electric incandescent lamps for the state capitol at Frankfort, Ky.

The Robert B. Randall Electric Company, 1315 Walnut Street, Kansas City, Mo., was awarded a $12,000 contract for the wiring of the new German Hospital, at Kansas City, the work including elaborate signal systems for three buildings, telautographs, interphones and light and power wiring. There will be about 25 motors, ranging from 0.5 to 45 horsepower, not included in the contract. Original provision was for a power house, but plans now call for use of central-station energy.

Ralph Melzard, Swampscott, Mass., has been awarded the contract for electric installation in the new Public Library Building. He recently wired the Neighborhood Club, Phillips Beach and large residences in the Magnolia summer resort section.

The Frazer & Morrel Company, Lexington, Ky., has been awarded the contract for the electrical work in the new Gilcher Hotel which is under course of construction at Danville, Ky., and which will cost approximately $100,000.

The Central Electric Company, San Francisco, Cal., has moved from 618 Mission Street to larger quarters at 175 Jessie Street, and has added a small stock of fixtures to its business. This company recently secured wiring contracts for the Women's Athletic Club, a four-story building.

Kriwanek Brothers, Denmark, Wis., have increased their capital stock from $25,000 to $50,000 and the company will engage in electrical and general contracting.

The Board of Education, Trenton, N. J., has awarded a contract for the installation of new electric lighting fixtures in the Junior High School to M. Fleron & Son, Trenton, N. J.

The Florida Electric Machinery Company, Lakeland, Fla., has secured the contract for the wiring of the new power house to be erected by the municipality for electric light and water supply.

George E. McGrath, of Monmouth, Ill., has been awarded the contract for the electric fixtures for the new Monmouth City Hall on his bid of $1,065.

The Common Council, of Newark, N. J., has awarded the contract for the installation of a new electric lighting system in the City Hall to Harry R. Jackson, of Newark, at a cost of $15,773.

A Unit Time-Card and Pay-Roll System

By George W. Hill

This article, the sixth of this series by Mr. Hill, emphasizes both the desirability and limitations of unit cost data, particularly labor costs. Valuable suggestions are given for keeping such costs accurately and conveniently and a form is described that has been found entirely satisfactory. Pay-roll records are also discussed. As usual, Mr. Hill includes considerable philosophy on business success. In subsequent articles Mr. Hill will discuss other features of accounting for electrical contractors.

Owing to the great amount of gambling in estimating, there has been a decided effort on the part of those who are interested in better conditions to find some means of eliminating it, and many different time cards and pay-roll blanks have been designed in the hope that it might be possible to arrive at a unit cost of installing certain materials under similar circumstances. It is admitted that, no matter how carefully selected, there will never be two jobs which will be exactly alike. While they may be strikingly so, there will be some phase of one job which will make it somewhat different from the others. It may be the weather or it may be the manner in which the material is delivered on the job, or it may be in the men who do the work. There are so many different elements entering into labor costs that there might be a vast difference in the cost of two jobs which would appear almost identical. The only method which has been suggested to date is to keep a comprehensive record of all work performed, both as to the whole job and parts of each particular job, as to material installed in a given length of time at different seasons of the year, and different kinds of material intended for the same purpose on different classes of work.

The writer has been confronted with the question many times in his travels among the contractors, "What is the average cost to install one-half-inch conduit in steel and concrete construction?" or "What is the average cost of stringing 1,000 feet of wire in a knob-and-tube residence job?" These are truly difficult questions to answer, for while there has been an effort made to ascertain this information, it has been so scattered and such a wide difference of opinion has developed as to how it should be obtained, that there has never been anything obtained which would in the opinion of the writer answer the purposes of all contractors.

So it remains in the case of obtaining the unit cost as it does in obtaining overhead percentages. It's up to the individual contractor to obtain this information based upon his own experience and not upon the experience of others. There are no doubt men in the contracting business who can by certain good management secure a much lower unit cost than others, and while the average would be of some assistance to the contractor, if he could not obtain

PAY ROLL

Starting Month	Day	Year	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Total Hours	Rate	Non Prod. Labor		Productive Labor		Total Amount Earned		Draws		Due		Received Payment

* Use two line of double space for Non-Productive Labor

Pay-Roll Sheet Which Can Be Used for Either a Collective or Individual Pay Roll.

the same results by his management it would be of no advantage to him. He might figure a job according to the average and the actual results would prove vastly different owing to his management, to the class of men he employs, to the inefficiency of the superintendent, or to many other conditions which existed in his business which did not exist in the business of another contractor. What he should have is his average cost based upon his own experience.

In the absence of anything like a comprehensive statement it has been suggested that each contractor obtain results from his individual experience. A unit time card has been designed which, if properly operated and a comprehensive record of the results obtained is kept, will prove at least a guide to the contractor in figuring future work; however, this cannot be absolutely relied upon, for while one man will do a given piece of work in a given time, another man will require more or less time.

The purpose of this card and the record of the results is to squeeze as much of the gambling out of estimating as possible and to give the contractor some idea of what it is going to cost him in the future to do certain pieces of work or to install certain units of material under certain conditions, knowing of course that there will never be two jobs just exactly alike.

A reproduction of this card is given herewith. By carefully observing it you will see that the number of the job is given, the name of the job, the hour when work was begun and when finished, a check space for the bookkeeper or timekeeper, a space for entering the amount of work performed or units installed, and another space for the name of the helper. This card will not only establish a unit cost but has a tendency to specialize the men in the employ of the contractor, for it will be observed that certain men will do a certain class of work much faster and better than certain other men, and without the knowledge of the men the contractor is enabled to specialize his employees. In case it develops that John Jones can install more half-inch conduit in concrete construction than any other man employed, then it would seem most natural that the contractor would give this man all of this work or as much of it as was possible for him to do. He would no doubt be better satisfied, for it usually follows that a man will do more of the work which he likes than that which he dislikes, and harmony among the men is more likely to exist. And let me say to you that harmony is as essential to good results in labor as it is to good music.

This card is designed to take the place of cards designed for a similar purpose, which have been produced with the hours of the day and the subdivisions of the hours into fifteen-minute spaces printed on the margin of the card. The men object seriously to the cards with the time of day printed on them, as they claim that this is too much like punching the clock. While the card represented here produces the same result, it does it in a slightly different manner and does not seem to be so obnoxious to the men required to handle it. The fact that a unit time card is kept on the journeyman and not on the helper does assist in obtaining the unit cost, for the helper's time must necessarily be figured in the unit cost. The fact that a certain amount of labor is required to do a certain job does not answer, but the records must be so kept that it will show the actual amount of labor required to perform the whole job and the unit of material entering into the job. This record will then be a guide to a contractor in estimating jobs which are similar; I say similar because there are no two jobs just alike.

With this record it is possible for the contractor to estimate very closely the amount of labor which will be required to install certain units of material under certain circumstances, and while the records will possibly never be the same on any two jobs it will undoubtedly have a tendency to throw considerable light on the cost before the job is taken, instead of doing, as many of us are more or less inclined to do, look the plans carefully over, measure up all the material and check it over several times to be absolutely sure that we have the proper survey of the material, and then say when it comes to the estimate of the labor, "Well, this building is 150 feet long, 80 feet wide and four stories high, and it should, on a good guess, require Tom, Dick and Harry about 30 working days to do this work."

Right here is where the contractors cause each other to look like a bunch of horse thieves when they hand in their figures on the same job. This is what causes the customer and the architect to lose confidence in the electrical contractor as a business man. They simply see as plain as the nose on a man's face that there is something radically wrong, and the only conclusion is that they are either gambling on the proposition and do not know their costs, or they have gotten together to hand this job to one certain contractor, while as a matter of fact it is simply due to the gambling element which is being injected into the electrical contracting business rather than an effort to eliminate it.

There will always be a certain amount of gambling in the contracting business, owing to the very nature of the business, but instead of men in the business making the conditions worse they should be making a decided effort to get on a business-like basis, where they will have the confidence of their customers as well as the jobbers and others who sell to them. Let us get down to brass tacks in this business, like the men do in other branches of industry. Let us find out what it costs us to put in a foot of half-inch conduit in concrete construction, what it costs us to install certain outlet boxes under certain circumstances and let us base our future figures on our own experience and see if we cannot get somewhere near a business basis. There are hundreds of men who are doing this and they are successful; but while we find one hundred who are doing so we find a thousand who are not doing it. I want to say again, and this will bear repeating, "There is a big difference between making a professional success of your business and a business success of your profession." Repeat this and think it over.

If you insist upon gambling, why not get into the horse-race business. It's more sport and you won't lose any more money on horses than you can in gambling in the contracting business, and you will have a lot better time spending your money.

DAILY TIME CARD

Workman ..... Date ..... 19...

Job No.	JOB NAME	Hours	Quit	Hours	Cts	MATERIAL INSTALLED	ASSISTED BY

Workman's Daily Time Card.

In this connection I desire to call your attention to a pay-roll blank, which was designed by C. A. Walker, of Rock Island, Ill., and which is in the opinion of the writer one of the most unique and satisfactory records ever produced for the purpose of recording men's time and their settlements for wages.

In many cases the contractor does not separate his productive from his non-productive labor, but simply figures

it all in as the cost of labor. This is not a fair basis, for in almost every case there is a certain amount of non-productive labor performed by the men which cannot be charged to any particular job, but which must be thrown into the overhead or operating expense and spread over the entire amount of business done by the contractor in the overhead percentage added to the cost of productive labor, material and other costs.

It will be noticed by closely examining the reproduction of this pay roll, that this blank may be used for either a collective or individual pay roll. It has been found desirable in many instances to keep each man's pay roll and settlement sheet separate, for in case this is not done when settlement time comes or pay day arrives, and the men come to the office to sign a receipt for their pay, they have the opportunity of seeing the settlement sheet of other men, who by the way may for good and sufficient reasons be receiving more money than others, and in very many instances when others find this out they cause some disturbance. I have known of many a good union man being brought up on the carpet at the union for drawing more money than other men working with him. This should not be an offense, but nevertheless it is so considered and for that reason I have always advocated that it is better to keep each man's time and settlement on a separate sheet, for when he comes to draw his pay the book is opened to his name, and he simply sees his own settlement and not that of the other men.

If this pay roll is to be used as a separate record for each man, then the man's name is written on the line at the upper left-hand corner, and the date that he begins work for the concern is recorded under the heading "Started" where the month, day of month, and year is written in the three spaces provided for that purpose. After thus taking up the headings as they appear from left to right, it will be seen that the first seven spaces are for the days of the week, the eighth is for the total hours, the ninth for the rate per hour, the tenth for the amount of non-productive labor, the eleventh for the amount of productive labor, twelfth for the total amount earned, the thirteenth space is left for recording any amounts which may have been drawn in advance of the pay day, and the last heading is for the amount due after such deductions, if any, are made; the final wide column to the extreme right of the pay roll is space provided for the workmen to sign a receipt for their settlement. Some men claim that it is not necessary to keep such a comprehensive record of time, but in face of the laws which are being enacted in nearly every state in the union with relation to labor hours, settlements, etc., an employer cannot be too careful of his labor records.

By carefully examining this pay-roll blank, it will be seen that there is a double space for the hours' work performed each day. The top space is for the non-productive labor, the bottom space for the productive labor and, since we have a column for the productive and non-productive labor cost, it is an easy matter to add up these columns and get the net result, which by the way might surprise some who have not been keeping such records. It may develop that their overhead would be considerably more than they have previously figured when they come to know the amount of non-productive labor which cannot be charged to any job, but is a part of the general operating expense.

These sheets may be punched and kept in an ordinary post binder of standard size, and they will make a valuable record for the contractor, as well as for the inspector who may call any day and desire to see such a record.

Convenient Electrical Key for Electrical Inspection Bureaus.

The 1916 edition of the "Electrical Key" has been published by Washington Devereux, Bullitt Building, Philadelphia, Pa. It is a book of 141 well-printed pages, of which the major part consists of a convenient key, comprising 962 separate items for the use of electrical inspection bureaus in advising electrical contractors, wiremen, etc., of corrections required so that installation will conform to the National Electrical Code and municipal regulations. The key affords a ready means of communication from the inspection department having jurisdiction to the contractors making the installation. The numbered items indicate the remedy for defects which are most likely to be found upon inspection of an electrical equipment.

Numerous tables and formulas, resuscitation rules, etc., are also included in the pamphlet. In the latter part of the book 54 pages are devoted to the changes made in the National Electrical Code in 1915 (which were published in the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN of February 19, 1916) and to some errors and discrepancies in the 1915 edition of the Code, particularly in its index.

Copies of the Electrical Key can be obtained from Mr. Devereux for 25 cents.

Record for Louisville Wiring Permits.

Electrical construction permits in Louisville, principally permits for installation of electric light wires, are being taken out at the office of the City Building Inspector at the rate of from 50 to 100 a day, more than have ever before been applied for in the history of the office. The principal explanation is that on the first of May the regulation providing for all-metal construction goes into effect and contractors and property owners are trying to get in on the lower scale. Under ordinary conditions the transition to metal conduit work throughout would not, it is stated, have made it necessary for the contractors to increase the price of the work appreciably, but with material prices up it is stated that construction of this kind after May 1 will amount to an average increase of $4 or $5 for each house.

PRACTICAL ASPECTS OF ALTERNATING-CURRENT MOTORS.

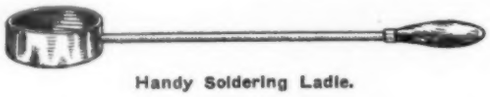
Although there has been much written on the subject of alternating-current motors, there has been felt among the ever increasing class of men dealing with the repair and installation of such machines, a need for a concise, practical treatment of the subject that would explain specifically, present-day problems that are continually arising. Beginning with the issue of April 22, we shall publish a series of articles by Justin Lebovici dealing with the practical aspects of alternating-current motors. The early articles will treat of the principles underlying the performance of all electric motors, with a classification and brief description of the various types of alternating-current motors. Subsequent articles will deal with the theory and practice of windings and with the relations existing between the windings and such requirements as output, voltage, speed, frequency, etc., thus enabling the repair man or electrician in charge to meet changed conditions.

DOLLAR WIRING KINKS

Every reader is invited to contribute to this page. It does not matter how few words are used to explain a "Dollar Wiring Kink," provided the idea is made clear; if a diagram is necessary, a rough pencil drawing will serve. The idea itself must, of course, be new and bright. A dollar will be sent to the contributor upon publication.

Ladle for Use in Soldering.

In rural districts and the smaller towns we find that electricians are not familiar with the use of a ladle in soldering joints, especially when hanging fixtures or making condulet connections. In these cases the work can be very greatly simplified by making a pig-tail joint, and then dipping it into melted solder kept in a ladle on the torch. This



Handy Soldering Ladle.

makes a well tinned and firm, as well as neat joint, and saves smoking up ceilings and walls in places where this would be objected to.

Probably the handiest and cheapest ladle can be made out of a large gas-pipe cap, say one inch to one and one-half inch in size; drill a hole in the side for a rod as a handle, and put on the end of the rod a wood handle from an old file or other tool. This simple arrangement is shown in the accompanying sketch. Such a ladle should be kept on the torch when making soldered joints of the type described, so as to be ready for dipping these joints into melted solder without delay.

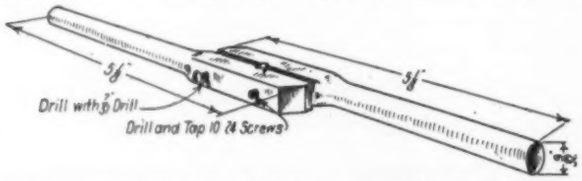
Carl W. Newman.

To Locate Conduit in Walls and Floors.

Many times wiremen wish to locate a run of conduit beneath an oak floor, and do not care to take up more of the floor than is necessary. The writer has had excellent success in locating conduit in floors and walls of considerable thickness by the use of a compass. Many wiremen are not aware of this simple test. The approximate position of the pipe is determined and then the compass is moved back and forth across the floor or wall until a position is located where the needle is deflected in neither direction. The conduit will be found to lie directly beneath the compass. L. E. Baldwin.

Handy Tap Wrench.

A handy tap wrench can be made as follows: Procure two pieces of five-sixteenths-inch square key steel, each a little over five inches long. Turn the handle ends in a

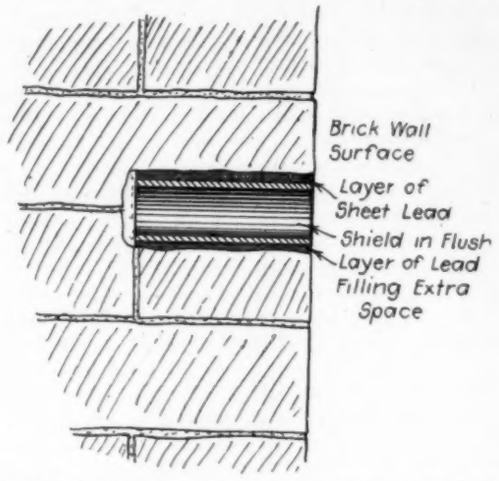


A Handy Tap Wrench Which Can be Used for Several Sizes.

lathe as shown in the sketch. Drill the inner holes with a seven-thirty-seconds-inch drill. Then drill the outer holes and tap for 10-24 machine screws. Screw the two pieces together and find and mark the exact center. File a rectangular notch in each piece at this point for holding the tap. This wrench can be used for several sizes of taps for light work. F. A. Grohsmeyer.

Tightening a Lead Expansion Shield.

A wireman sometimes uses a larger brick drill than he should for drilling holes for screw expansion shields. Whenever I find that the expansion shields will not hold



Method of Tightening Expansion Shield in Brick Wall.

the screws tight, I wrap a layer of thin sheet lead around the screw shield; this fills the extra space and provides a good tight place to drive the screw into.

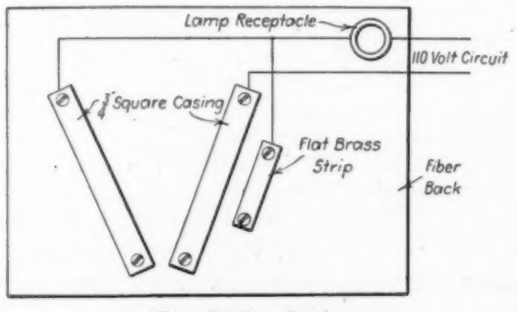
M. J. Moriarty.

Bolting on Covers of Cutout Boxes.

In fastening a cover on a cutout box or pull box, where the holes in the box are not threaded or for some reasons the threaded hole has to be reamed out, stove bolts can be used. Place the nut right under the hole. Then take a little putty and place it over the nut and around its sides; this will hold it in place. Put cover on and screw in the bolts. Care should be taken not to fill the threads with the putty, however. Benjamin Swanson.

Handy Device for Fuse Testing.

A very handy device for use in testing cartridge and plug fuses is made as shown in the accompanying sketch. On a fiber board are mounted two pieces of three-quarter-inch square casing, such as is used on fixtures with square



Fuse-Testing Device.

arms. These are so arranged as to form a V-shaped angle. Along one side of one of these pieces of casing is mounted a flat strip of brass. The wiring is as shown, a lamp receptacle being put in series with the circuit. By this arrangement it is possible to test Edison plug fuses between the two parallel strips at the right by merely touching them to the strips. Cartridge fuses, whether of the ferrule or knife-blade type, are tested between the V strips. Thus this arrangement takes any size of fuses up to 400 amperes. E. M. Raetz.

THE DEALER AND STOREKEEPER

An Exchange of Ideas and Experiences on Advertising and Selling Methods, and Store-Keeping for the Dealer in Electrical Goods

CREDIT EFFICIENCY A MEANS FOR THE PREVENTION OF BAD ACCOUNTS.

Pertinent Suggestions to the Merchandiser for Handling of Credits and Credit Accounts.

By W. B. Parker.

This is the fourth of a series of articles appearing in this publication on the subject of credit and collection efficiencies. At first thought it might appear as if this article should have preceded the articles on collections, because a defective credit system is a prerequisite of slow collections. However, the majority of business men, on account of already having bad accounts on their books, are more readily interested in the subject of collections than in preventing a similar condition in the future. For this reason the logical order of publication was reversed, and the writer trusts that his suggestions on handling collections have already borne sufficient fruit to induce a careful study of the matter of sane credits.

Too often credits are granted indiscriminately, merely to acquire a greater volume of business, in the belief that while some losses will occur the profits of the increased business obtained will more than offset the losses, and that, therefore, a careful plan of extending credits is unnecessary. The records of failures reported through the mercantile agencies daily prove the falsity of this theory. "There is a reason" should be the basis of every credit granted, and the conditions on which credit will be granted should be decided on in advance and not deviated from. Intuition and guess work are exceedingly unsafe guides.

Generally speaking, all credits should be based on knowledge of the character, habit of pay and financial responsibility of the applicant. The moral hazard is the greatest in the average mercantile transaction, and it, therefore, follows that character should be given the first consideration. A reputation for prompt settlement of obligations, combined with an otherwise reputable record, would form a safer basis for moderate credit than the ownership of property and a questionable reputation. In fact, it is a serious error to base the granting of credit on evidence of financial responsibility alone.

The next requirement of an efficient credit system is an adequate plan for securing accurate information regarding the applicant. This is usually done through either mercantile agencies, banks, merchants' associations or direct reference to other merchants with whom the applicant has done business. And that little word "either" explains where much of the trouble comes in. Merchants' associations are growing so fast that more and more merchants are coming daily to rely on them entirely for their credit information. This is a great mistake, even in the smaller communities. The mere fact that the applicant for credit has a favorable rating on some mercantile agency's or association's records should not mean that no other steps should be taken to obtain further information. It is, of course, a reasonably safe basis for the granting of a moderate credit in the first instance, where time for further investigation is lacking, but as soon as possible all other sources of information should be drawn on. The fact that the agencies and associations find it necessary to issue revised rating books four times a year or more shows the changes that are constantly going on in the financial circumstances of those rated. The wise credit man will endeavor to have information of credit deterioration on the part of any of his customers in advance of such general publication, instead of finding it out after he has already unwisely extended a long line of credit.

In other words, eternal vigilance is the price of credit safety. Even in handling a comparatively small volume of business the use of a card system for recording credit information is advisable. The key ratings used by agencies and associations should be copied on the cards and notes made of all other information received, so that a glance at the card will show the agreement, or lack of it, among the various sources of information. Where a card system is in use in the handling of collections the reverse of these cards may be conveniently used for these credit notations.

When deciding to grant credit to any applicant the maximum of credit that is deemed safe to extend should be decided on, and this amount should be entered on the credit card. The amount should depend to a large extent on the normal requirements of the customer for the goods dealt in, as well as his income. In the retail field, for example, a man with an income of $100 a month might be allowed a maximum of $50 a month for groceries and meats. It would be very poor judgment, however, to allow his wife to average such an amount for dress goods. When a merchant encourages or allows a customer to purchase goods on credit to an amount beyond his ability to pay without hardship he is almost surely placing an account on his books that will give him much trouble if not actual loss.

In this connection it should be noted that the matter of the granting of credits should be handled by one man only. In the case of a partnership or company one of the firm should take the entire responsibility of this end, if an experienced credit man is not employed. In no case should a matter so important as this be left to the judgment of a clerk or other employee.

The lack of proper methods in the granting of credits and handling credit accounts has caused so much loss that a business man who has been unfortunate in this regard is apt to overlook the real reasons for the loss, and decide against the further granting of credit to any one. It is true that cash methods of doing business are possible and perhaps advisable in some lines, in certain localities and under certain conditions, but for the majority it is not practicable. When a merchant has decided to do an absolutely cash business it almost invariably means that he is passing up a large amount of the most profitable trade in his community.

The fact that all the largest and highest dividend-producing department stores grant credit readily would indicate that this conclusion is correct. The one real reason for deciding to do a strictly cash business, where merchandise instead of service is involved, is lack of capital to carry the accounts. Except for that reason the credit system can be safely adopted if the proper safeguarding methods are also used.

Dealer and Manufacturer Must Co-operate

Liberal Interpretation of Guarantees and Support of Dealers Will Solve Some of the Present Difficulties in Electrical Merchandising

By G. D. Crain, Jr.

A growing and important factor in the electrical field is the retail merchant. The distribution of electrical merchandise to the consumer has been growing so fast that contractors in many cases have waked up to find themselves in the dealer class as well. Manufacturers, in creating new outlets, have not always had time to smooth off the rough edges of their sales policies, and there has been opportunity for the creation of conditions which are not always satisfactory.

The situation, in general, is one which demands co-operation. On the one hand is the maker of the goods, anxious to secure sales, and at the same time desiring to hold the expense of replacements of defective goods down to the minimum. On the other side is the dealer, equally anxious to get business, and at the same time to give his customer the service which he feels is necessary, and to interpret the conditions of the guarantee in such a manner as will satisfy the user of the goods.

It is the spirit in which the situation is approached that makes all the difference in the world. If the manufacturer makes it clear to his dealer that he is anxious to do everything in reason, that is equitable and right, and if the dealer does not take an arbitrary position, insisting on concessions which are not in keeping with the requirements, the situation will take care of itself. On the other hand, lack of harmony, and an insistence on technicalities on either side, and especially by the manufacturer, can easily disrupt trade relations which ought to be pleasant and profitable for everybody concerned.

The need of a liberal attitude toward the dealer is being emphasized in many quarters. Holding him rigidly to account and reading agency contracts, guarantees and similar documents too literally, do not make for the sort of enthusiastic co-operation which is needed in spreading the good news of what up-to-date electrical merchandise can do to make living conditions more agreeable.

Interpretation of Guarantees.

The guarantee especially seems to be proving a stumbling-block to the development of correct relationships between manufacturers and their retail representatives. Most of the guarantees contain a provision that the manufacturer warrants the goods to be free from mechanical and electrical defects for one year, and that repairs or replacements will be made, provided freight charges both ways are paid.

The last clause is the fly in the ointment, for the reason that in most cases the merchant is called upon to absorb this expense. The factory man has announced that he will make good any defective part, but that he won't move a step away from his plant in order to do so. The consumer, on the other hand, may or may not know the manufacturer; but he does know the dealer, and the latter is the one who is held responsible, and who is asked to make good under any guarantee proposition. In the event that a breakage occurs, it is the dealer who is called upon to shoulder the expense of taking the machine down, sending the part to the factory, and re-installing it when the new part arrives or the repaired machine returns, as the case may be.

It is possible, theoretically, to make the customer pay this expense; and in some cases, notably the automobile business, the owner of the car (who is accustomed to getting the hot end of it all along the line) usually submits without a murmur, if something goes wrong with the electrical equipment. But the average consumer does not restrict the interpretation of the terms of the guarantee to cover merely replacement, without including freight or labor. He puts this squarely up to the dealer. Possibly the latter should be strong enough to refuse to take care of these factors; but the realization that a broader policy is necessary, in order to hold the good-will and the trade of the customer, results in the dealer going far enough to involve himself in a good bit of expense before he gets through.

That is why the margin of profit on a given item, even assuming that it is liberal—and it is not always so—shrinks considerably when the cost of delivering service during the term of the guarantee is considered. Under the circumstances, the dealer can hardly afford to take care of these expenses unaided. By the time that the labor of the men needed to take down and re-install a machine is added to the cost of transportation, the expense is almost prohibitive.

Sometimes, it must be admitted, the manufacturer does not meet the dealer at that half-way point where agreement is usually found, but rests on his rights as indicated in the guarantee. This means that the dealer is between two fires—the demands of his customers, which must be considered, and the limitations of the manufacturer, which can hardly be overstepped. Is it any wonder that a lot of distributors are beginning to consider where they are to "get off"?

Typical Cases of Differences.

A few typical cases will illustrate the situation and may serve to suggest a remedy.

A dealer who represents a well known concern manufacturing battery-charging equipment was recently called on by a customer to take care of a breakdown. It was found that there was a defect in the machine, which could best be repaired on the spot. To take down the charger—which involved putting the electric car of the customer out of commission for some time—ship it to the factory and await reshipment at its convenience, all of this at the expense of the dealer, seemed to involve more money and more trouble than the situation justified, in the judgment of the manufacturer's local representative.

With the desire to render service to the customer, the dealer went ahead with his own repair facilities and put the charging apparatus in good working order. The cost of the job was $7, and a bill for it was sent to the factory, the assumption being that in view of the fact that the dealer had probably saved everybody concerned some money, the item would be taken care of without delay. However, the reply which was received did not indicate that this would be the outcome, but included the following statement:

"We are in receipt of your charge for repairs on our charger for Mr. Blank. Please advise us what this covers and who authorized the charge. You no doubt know that our guarantee covering apparatus sold does not permit outsiders to make repairs on the apparatus and charge the same back to us."

Possibly in this case the dealer did not explain fully the

conditions which had led to a technical violation of the guarantee provisions; possibly, also, if he had done so, the agreement to pay the item would have been forthcoming promptly. Nevertheless, the tone of the letter was hardly of a sort to make a dealer feel good, especially that portion of it classing him as an "outsider." As a matter of fact, the customer was the manufacturer's customer, as well as the dealer's; and the dealer is on the same side of the fence as the maker of the goods, and ought not to be put in the category of outsiders, who are beyond the pale and not entitled to any special consideration.

This is really the crux of the matter. The manufacturer should be close enough to his dealers to know and trust them. He may not always be willing to rely upon their judgment in such cases, and he may find it advisable to require specific authority to permit the dealer to make repairs, instead of having them attended to at the factory, but, at any rate, there should be a feeling of mutual confidence that will eliminate the suspicious and almost unfriendly tone which may creep into a letter such as the above.

"It seems to me," said the dealer referred to, "that a concern which goes out to appoint representatives ought to select nobody in whom it hasn't full confidence. If it has confidence in the dealers who are handling its line, it ought to be willing to give them some leeway in the matter of service. In this case it was simply up to me, from the standpoint of doing the right thing by the customer, to make those repairs and get the charger to work in the shortest possible time. To begin splitting hairs over whether the guarantee under which I made the charge for the work requires a return of defective equipment to the factory or not is adopting a narrow policy, which it seems to me cannot work out right."

Not long ago another electrical merchandise dealer, who is selling washing machines on a narrow margin of profit, received notice from a customer that the machine was broken.

In order to find out what the matter was it was necessary to send a man to the home of the customer, who lived in a suburb several miles out. He found that a broken gear had developed, probably from an overload. However, he could not, of course, prove this, and consequently agreed to replace the gear, under the guarantee which covered the machine. He returned to the store, where arrangements were made to send the gear back to the factory. Later on a new gear was received, taken out to the customer's house and put back in the washing machine.

That made everything all right, didn't it? Yes, for everybody except the dealer. The customer got service, and the manufacturer paid for the gear—but somehow the dealer was lost sight of in the shuffle. The time involved in the two trips to the home of the customer was sufficient to more than eat up the original net profit in the washing machine.

This suggests that either the margin of profit on such goods be sufficiently large to enable service to be paid for, or that the manufacturer should assist in rendering this service. Of course, there is the alternative of charging the customer for everything except the actual replacement, but it seems to be agreed that this is impracticable in most cases.

This instance calls forth the reminder that there is room for improvement in the wording of guarantees, and no doubt much trouble, time and expense could be spared both the dealer and manufacturer if the guarantees on some appliances were not so general, but more specific in their terms as to conditions under which replacements will be made.

One more case, which is of a typical nature, will help to show the situation. In this instance a contractor who handles a big motor business was involved. He sold a transformer, and ordered it from one of the biggest concerns in the country. When it arrived and was about to be installed, it was found that a bracket which was essential to the job had not been sent. It would have been possible to notify the manufacturer, have the bracket shipped, and calmly await its arrival before completing the job.

In the first place, however, the men of the contractor were already at work, and it would have cost something to stop them and transfer them to some other job. In the second place, the customer wanted hurry-up action, as is usually the case. The net result was that the contractor went into his own shop and had a bracket made at a cost of $3.

The manufacturer refused to pay the bill, pointing out that the dealer had no authority to make the bracket, and that the cost was much greater than it would have been had it been shipped from the factory. The dealer, by reason of his desire to avoid a greater loss, and in order to take care of his and the manufacturer's joint customer, thus appears to be "stung" to the extent of $3.

What's the answer?

What Is the Responsibility of the Dealer?

This is a big question, and not one that can be disposed of off-hand. Obviously, also, there are two sides to the subject. The manufacturer does not feel like giving every representative carte blanche to go as far as he likes in making repairs on his, the manufacturer's account, for the reason that not every dealer has the judgment as to such matters that would be needed to conserve the interests of the maker of the goods. On the other hand, the manufacturer cannot afford to be small in treating with the dealer, especially where it is evident that the object of the latter was to provide service to the customer.

An electrical man, who is a manufacturer, a jobber and dealer, all at the same time, making and distributing his own and other companies' products, said recently that he believed that the limitations placed in the guarantee and agency contracts are necessary to protect the manufacturers from unreasonable demands on the part of the consumer or the dealer, but that, on the other hand, the manufacturer should be willing to consider every claim on its merits, and assume the burden of the expense where the equity of the case suggests.

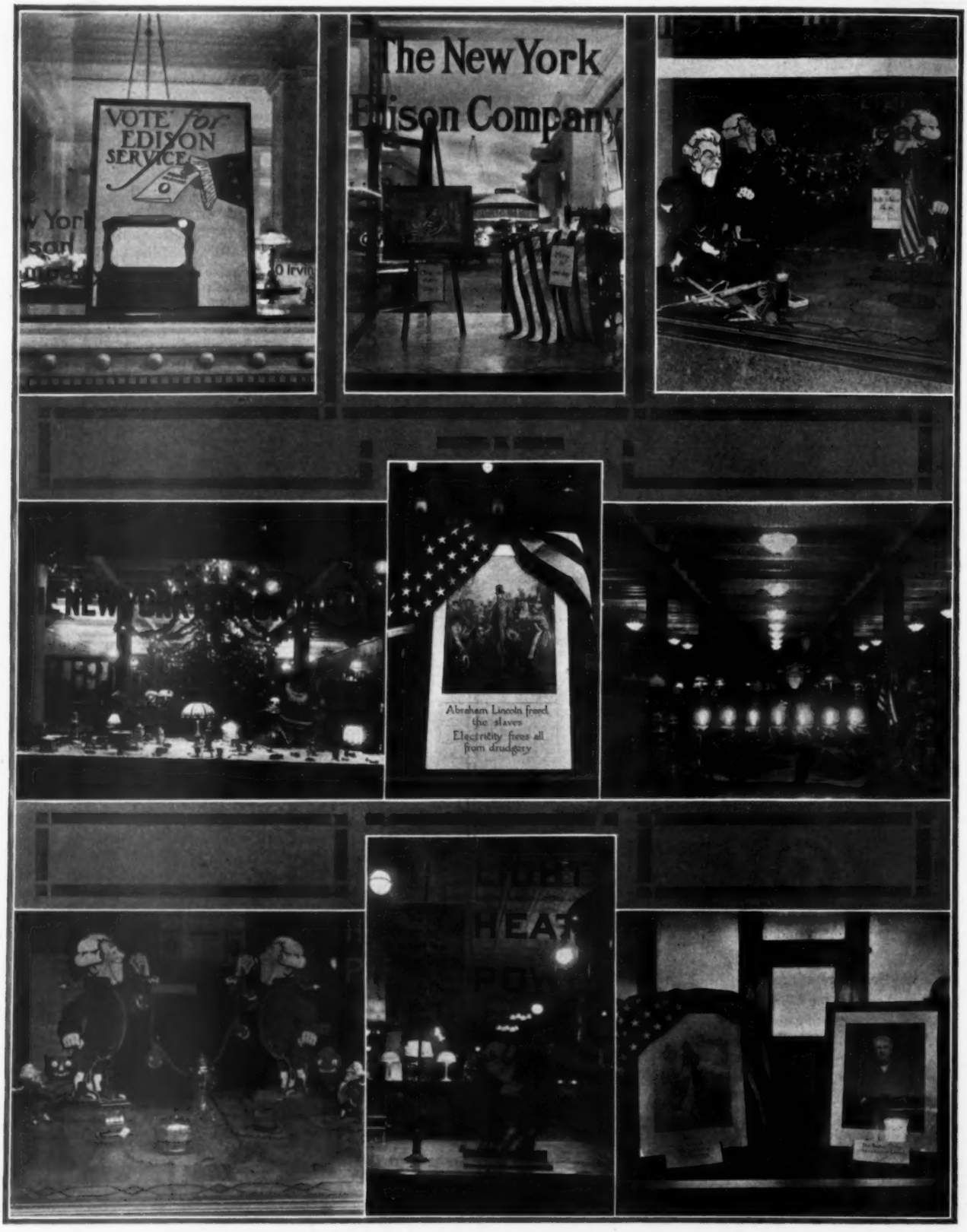
"The dealer naturally wants to stay on the good side of the customer," he said, "and if he can shift the burden to the manufacturer, he will do it. If the maker were too easy in the matter of making replacements, due to faulty operation, such as overloading, paying not only for new parts, but for the labor involved, he would soon be flooded with such claims, and would be unable to continue in business.

"But if there is a legitimate case, in which the dealer is put to expense in taking care of the reasonable requirements of the customer, the manufacturer, if properly approached, will, in most cases, do his share. The trouble is that the dealer often fails to state the case fully, and hence the manufacturer is left to suppose that the work was done without its being really necessary.

"To insure continuance of the relations which the manufacturer desires to maintain, inasmuch as the dealer is his customer, there should be a full statement of every such experience, so that a decision may be made with all the facts at hand."

The solution of the problem, from this angle, then, would seem to be mutual confidence, whereby the dealer is willing to lay all his cards on the table and trust to the fairness of the manufacturer, and the latter is ready and willing to assume his share of the expense when conditions justify. Such a situation involves real co-operation, and co-operation is the answer to most problems of distribution, including the difficult matter of service and guarantees.

Timeliness in Prize-Winning Window Displays



A Year of the New York Edison Company's Prize-Winning Windows.

Arthur Williams, general commercial manager of the New York Edison Company, in March, 1915, inaugurated a plan of giving prizes as incentive for new ideas in appropriate window displays for holidays and days of special interest during the year. Mr. Williams offered first and second prizes of $10 and $5, winners being decided by a committee of seven. Drawing power, economy, adaptability to the many show rooms of the company and the extent in which electricity is featured are major considerations in making the awards.

QUESTIONS AND ANSWERS

All readers are invited to submit questions and answers to this department. Anonymous communications will not be considered. Questions should relate to electrical matters of any kind. Answers contributed by readers should be received preferably within ten days of the date of publication of the question. Payment will be made for all answers published.

Questions.

No. 341.—CONTROLLER FOR BASCULE BRIDGE.—A bridge-machinery designer has told me that it is impracticable to introduce any automatic control features for the motors operating bascule bridges because of the variable load due to wind, sleet, etc. Have any bridges of this type ever been equipped with automatic controllers, or at least automatic limit switches to prevent smashing or upsetting the bridge leaves or breaking the machinery from running too far?—W. W. G., Wilmette, Ill.

No. 342.—TROUBLE FINDERS.—Please have some one among the questions and answers contributors explain for me the principles on which the wireless electrical pipe and trouble finders are built and operated. Please show by simple diagrams the methods of wiring used in both the exploring coil and wave transmitter.—F. A. B., St. Joseph, Mich.

No. 343.—THEATER EMERGENCY LIGHTS.—Rule 38*a* of the National Electrical Code provides that "where supply to a theater cannot be obtained from two separate sources, the feed for emergency lights must be taken from a point on the street side of main service fuses." Has this provision been found ample for the purpose? Would it not be desirable to insist on an entirely independent source, such as a storage battery?—J. H. R., Pittsburgh, Pa.

No. 344.—LIFE OF GAS-FILLED LAMPS AT VARIOUS VOLTAGES.—What is the rated life of 110-volt Mazda "C" lamps at rated voltage and at voltages two per cent above and below rated voltage? If available, kindly give data on the life at various voltages ranging both ways from 110 volts up to eight per cent.—R. D., Washington, D. C.

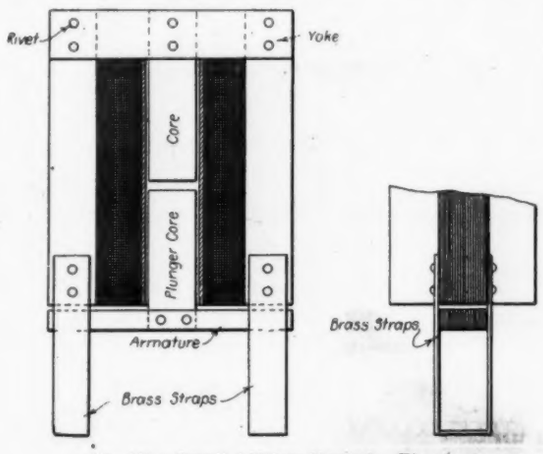
No. 345.—DEMAGNETIZING IRON CASTINGS.—How can magnetized iron and steel castings be readily demagnetized? We are experiencing a great deal of trouble with castings that have been magnetized by the lifting magnet in the foundry yard. When these castings are being machined, it is impossible to get the true size, inside or outside diameter, because of the magnetic attraction on the calipers. Some of our work is large and some quite small. An alternating-current demagnetizing coil would have to be too large and costly to be practicable. Is there no cheaper or easier way to demagnetize these castings?—J. B. K., Torrance, Cal.

Answers.

No. 331.—SMALL LIFTING MAGNET.—I am looking for a small solenoid magnet that can lift about one pound with a one-inch stroke; it must be wound for not over 20 volts. If no magnet of this kind can be readily secured on the market, I would like to have the necessary data for constructing it myself.—F. A. K., Los Angeles, Cal.

The accompanying sketch gives practical suggestions for building a small lifting magnet of the size required. The steel laminations are built up to half-inch depth. One-half the outside legs are cut 3 inches, and the remainder 2.5 inches long; they are then assembled alternately so that they will dovetail into the yoke, which is 2.5 inches long. One-half of the steel strips for the yoke are cut 2.5 inches long, while the remainder are cut one-half inch long.

The core is 1.75 inches long by one-half inch, with one-half of the strips cut 1.25 inches long. The one-half-inch pieces of the yoke are used to fill in between the core and the outside legs. The plunger core is 1.5 inches long and built up of pieces of steel cut seven-sixteenths inch wide, one-half of them 1.5 inches long and the remainder 1.25. The armature is 2.5 inches long by 0.25 inch deep and a half inch wide, with half of the strips cut one and one-thirty-second inches long. To the ends of the outside legs are riveted brass straps which act as guides and as a one-inch drop limit for the armature. The core is to be fitted with a square brass tube 2.5 inches long and this should be slotted with a hack saw, insulated with empire cloth, and wound with four layers of No. 14 B. & S. cotton-covered magnet wire to a coil 2 inches long when required for direct current 20 volts. If alternating current, however, is to be used No. 12 B. & S. wire will give better results. This design makes a powerful lifting magnet, and the materials used will not cost more than $1.00. With a little care it can be nicely assembled in a short time.—G. W. E., Pittsfield, Mass.



No. 331.—Small Lifting Magnet.—Fig. 1.

It will hardly be possible to find a little electromaget of a lifting power of one foot-pound ready-made in stock in a supply shop; most of the lifting magnets in the market, being for operation of brakes and motors, cranes, etc., have a much greater lifting power—12 to 15 foot-pounds and more. Besides, the shape of a lifting magnet is generally dependent on the purpose it has to fulfill, so it will be better to have it specially made after a general drawing.

In the following the general design will be given of a simple plunger-type electromagnet, as shown in the sketch; it is assumed that the available pressure of 20 volts is of direct current, so that core and plunger can be made of solid iron. Should, however, only alternating current of 20 volts be available, the iron part must be laminated.

The magnetic pull between two magnetic poles is (from Maxwell's equation)

$$P=B^2A/11{,}200{,}000$$

where B=maxwells per square centimeter,
A=surface in square centimeters,
P=pull in pounds.

Now, as the plunger has also a certain weight which the magnetic pull has to lift besides the useful weight, this must be taken into account. This weight may be taken, at the first guess, to be one pound; it must be verified later and the winding altered correspondingly after the whole electromagnet has been laid out. The weight depends to a great extent on the purpose, but the illustration of the example will show how to proceed.

On account of the smallness of the apparatus and the comparatively long stroke we choose the magnetic density to be about 3,000 maxwells. With a total weight to pull of two pounds we arrive at the surface of the pole of

$$A=11{,}200{,}000\times 2/9{,}000{,}000=2.49 \text{ square centimeters.}$$

The plunger to be of soft round iron will therefore have a diameter of 17.75 millimeters. To account for some leakage and a little margin, take 0.75 inch diameter (=19.05 millimeters), which gives a section of 2.87 square centimeters .

The shape of the electromagnet may be seen from the sketch, Fig. 2. *A* is a cast-iron (or malleable-iron) frame; *B* a soft-iron plug; *C* the plunger; *D* the coil; *E* a lining with

a brass tube and F a little brass or copper stud to prevent sticking of the plunger to the iron frame.

We can now proceed to determine the winding. The magnetomotive force to drive the flux through the iron is entirely negligible against the length of the air gap. In the beginning the air gap, that is, distance between plunger and plug, is one inch or 2.54 centimeters.

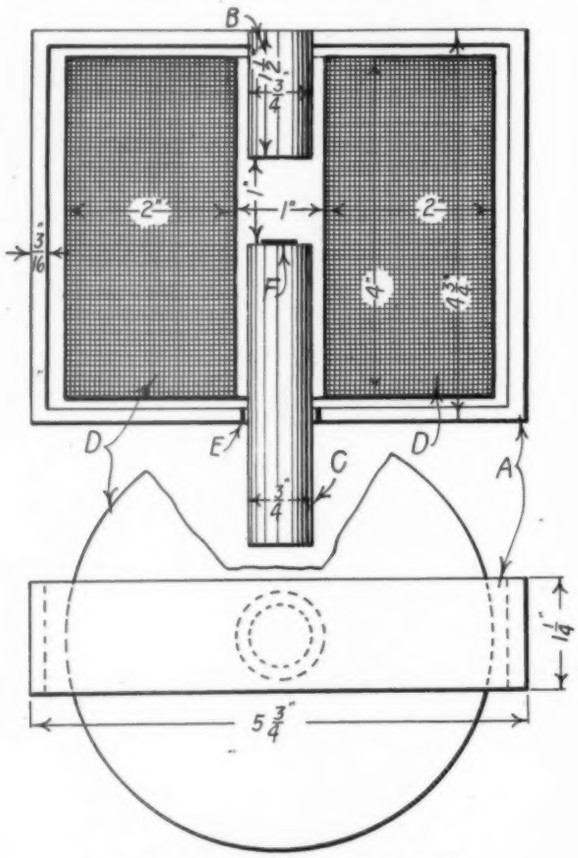
The necessary ampere-turns we get from the equation

$$AT=0.8\times B\times L$$
$$=0.8\times 3{,}000\times 2.54=6{,}100.$$

Assume a thickness of the coil of 2 inches; the mean length of turn will be $3\pi=9.5$ inches. The section of the wire can be determined from

$$s=0.000829\times AT/1{,}000\times LM/E$$
$$=0.000829\times 6.1\times 9.5/20=0.0024 \text{ square inch, which corresponds to a diameter of } 0.055 \text{ inch.}$$

From wire lists we find No. 15 B. & S. = 0.057 inch in diameter = 0.00255 square inch area. For intermittent service (time



No. 331.—Small Lifting Magnet.—Fig. 2.

of rest at least double of time of operation) the current density may be taken as approximately 1,600 amperes per square inch, which gives for our wire 4.1 amperes. The number of turns becomes 6,100/4.1=1,500. The insulated diameter of the double-cotton-covered wire is approximately 0.069 inch. As the coil is to have a depth of 2 inches, the number of layers is 2/.069=29 and the number of turns per layer 1,500/29=52, which gives a length of the coil of $52\times 0.69\times 1.05=3.8$. We take four inches; five per cent is taken as allowance for inequalities in the insulation.

The dimensions of the iron part can now be determined, the same magnetic densities approximately to prevail in all parts. This gives then the dimensions as shown in the sketch; the calculation is so simple that it need not be given.

The length of the wire will be $1{,}500\times 9.5/12=119$ feet total, and the weight 1.25 pounds approximately. The resistance cold is 0.38 ohm which permits a current to flow at 20 volts of 5.25 amperes. The magnetomotive force is therefore 7,900 ampere-turns maximum, i. e., a margin of 29.5 per cent. The energy consumed is 105 watts. A suitable resistance in series with the coil can reduce the current to the right value when testing the magnet out.

Should the source be alternating current of 20 volts, the calculation is practically the same, but to avoid heating of the iron the magnetic circuit must be made of laminated iron. For convenience, the plunger will then not be round, but of square or rectangular section. In this case, the dimensions could be 5/8 by 5/8 inch, while the section of the frame might be the same as before. If any other form of the electromagnet is more suited for the case in question, the determination of the coil will be similar as shown in the foregoing example.—H. A., Pittsburgh, Pa.

No. 338.—Grounding of Motors.—What is the best way to ground a group of motors? Can motors of different voltages be connected to the same ground plates, say in the case of 110, 220 or 440-volt alternating-current machines?—R. B., Jackson, Mich.

When all the wiring to the motors is in steel conduit, the best way to ground the frames is to connect them to the conduit by means of suitable lugs and ground clamps. Where the motors are close together and are not wired for in conduit, an iron pipe can be run from the base of one motor to another and well grounded at some convenient point, thus grounding all the motors. The pipe is mechanically superior to several ground wires.

Yes, motors of different voltages may be connected to the same ground plate, as the object of the ground is to keep the motor frames at "earth" potential.—J. S., Victoria, B. C., Canada.

No. 340.—Three-Phase Versus Single-Phase Transformers.—If the three-phase transformer actually possesses all the advantages that are claimed for it, why is the three-phase distributing transformer not used instead of the single-phase on a larger scale? How do the two compare as regards reliability and cost?—N. T., Chicago, Ill.

It is customary in America to use three single-phase transformers for changing from one pressure to another on a three-phase circuit. In Europe three-phase transformers are used, in which there are three primary coils and three secondary coils wound on a three-legged iron core. The general practice here is to use three standard single-phase transformers connected up either star or delta, as may be required.

This may be attributed to several reasons. For instance, if one coil or phase of a three-phase transformer burns out, it will undoubtedly damage the other two and may result in a total burnout, or if not, it is not altogether safe to repair or cut out the damaged coil with the current on and this means interrupted service. In the case of the three single-phase transformers one can be taken out and the remaining two can maintain the service until repairs are made or a new transformer substituted. Again, in the case of a total burnout, it is cheaper to replace one single-phase transformer than a three-phase transformer.

Three-phase transformers can be made as rugged as single-phase transformers and therefore are as reliable. They are also cheaper than banks of three single-phase transformers, as there is not nearly as much material needed for core and frame as in the case of three single-phase. They are mostly used where space will not permit the installation of a bank of three single-phase units, such as in a manhole, etc. Whenever space can be obtained and first cost is not as essential as uninterrupted service, it is best to use the three single-phase transformers. They have greater radiating surface, therefore keep cooler under the same load conditions, and they can be more easily handled as one can be separated for inspection and repairs without interrupting the service.—W. T. E., Ansonia, Conn.

NEW APPLIANCES

A Weekly Review of the Latest Developments and Current Information Respecting Electrical and Kindred Mechanical Appliances

Hotpoint Electric Ranges.

After 14 years of very extensive investigation and research to discover the most efficient method for the application of electric current for general cooking, the Hotpoint Electric Heating Company, of Ontario, Cal., advises that its engineers have concluded that the open-coil reflector type heating element is the most desirable from every standpoint of efficiency. The next problem which confronted the engineers of the company was to design a supporting frame sufficiently durable and that would absorb a minimum of the heat units developed by the heating element. In order to obtain a maximum of durability with a maximum of efficiency the Hotpoint engineers have built their new heating element of steel and porcelain imbedded in steel, in a truss form of construction that makes for rigidity and absorbs a minimum of heat. The company has adopted this glowing-coil reflector type of heating element of porcelain and steel and it is known as the "Hotpoint Reflex Burner."

The importance of the heating element, or "burner," in an electric range makes the following statements exceptionally pertinent to those interested in electric range cooking. The Hotpoint reflex burner is claimed to excel in:

Hotpoint Electric Range, Model D.

Speed.—Working temperature is reached within 15 seconds after current is applied and an element wound for 1,500 watts with a diameter of not more than 8.5 inches approximates the speed of a modern-sized gas burner, something which has never before been accomplished with an electric range.

Economy.—Highest economy is obtained because the principle upon which this element transmits heat to the cooking utensils is very similar to the gas burner and any type of cooking utensil can be used to good advantage. It is well known that dark surfaces absorb heat and bright surfaces reflect it. Careful investigation has shown that the majority of utensils used in the home have a more or less dark or dull bottom. This fact influenced the construction of the reflector type of burner as it shows great economy and efficiency when using the ordinary utensils found in the home. It operates directly on the principle that dark, dull surfaces absorb heat rays more rapidly than light colored, bright surfaces. The Hotpoint reflex burner is said to be extremely efficient in the use of graniteware utensils so common in the average kitchen.

Cleanliness.—The arrangement of Hotpoint reflex burners in the surface of Hotpoint ranges is such that these burners or elements are quickly and easily accessible. The reflector plates, by a novel arrangement, rest on the crumb tray which pulls out the same as a crumb tray on the ordinary gas range, when the reflector plates can be lifted off. The fact that there is a space of approximately one inch between the coils and the reflector plate makes it impossible for food to accumulate around the coils, thus minimizing the danger of disagreeable odors and the risk of coils being subjected to excessive temperatures and consequent breakdown through lack of air circulation. If repairs at any time should prove necessary, the element is easily removed by taking out three screws which make the electric connections.

Psychological Effect.—The psychological effect of the open-coil type of element is a feature not to be overlooked. We are accustomed to "seeing" fire in connection with cooking and the glowing coils give confidence and besides, show whether the current is on or off.

The company states that a Hotpoint reflex burner under test with competitive heating elements under exactly parallel conditions showed it to be from 20 to 42 per cent more efficient than the other elements, depending on the utensil used. Each Hotpoint reflext burner is controlled by a three-heat indicating snap switch.

One point particularly essential to win the housewife's favor is that the Hotpoint reflex burner does not require special cooking utensils; any ordinary kitchenware gives satisfactory results.

The Hotpoint range is made in five models to suit the needs of either large or small families. Model D is illustrated herewith. Four of the models are of the standard gas-range design; another is modeled after what is known as the gasoline stove type. All models are finished in black enamel. The ovens of four of them are lined with aluminized steel and high-grade mineral wool is packed between the walls. The prices of the ranges are from $40 to $90.

Improved Dover Electric Flatirons.

The manufacture of electric flatirons has been developed to a large scale and a considerable number of reliable irons are now on the market. Development in this industry has been continued by many manufacturers and notably by the Dover Manufacturing Company, Canal Dover, O. This company has been in the business of making irons some 21 years, during which it has established an enviable reputation for its "Asbestos" sadiron, which is a stove-heated iron with a number of separate heating units.

Several years ago the company began developments along the lines of electric flatirons and during 1913 brought out an innovation in this field in its Abesto automatically regulated electric iron, which was described in our issue of August 16, 1913. This iron includes an automatic

thermostatic cutout which can be adjusted to any point between 300 to 600 degrees Fahrenheit; this cutout automatically opens the circuit as soon as the iron has reached the temperature desired. When the iron has cooled off a few degrees below this point, the circuit is again automatically closed. Thus this cutout acts as an automatic regulator of the temperature of the iron and enables the operator to maintain just the right amount of heat for the particular goods being ironed. It also eliminates the danger of overheating of the iron and possibility of starting fire from neglect to open the circuit when the iron is left. Since the time this iron was described it has been perfected in a number of details and has met with very large sale.

The company also makes the Dover electric iron without the automatic regulator feature. This iron, a partly sectional view of which is shown in the accompanying illustration, has recently been made the particular subject of a strong publicity campaign which the company is conducting through national advertising mediums. The heating unit in this iron, as well as in the Abesto iron, is what is known as the "Vea No-burn-out element," on the perfection of which the company has spent some seven years of research and experiment. The resistance wire is Nichrone. This is embedded in a refractory insulating composition made of fused alumina. This material has been selected because of its exceptional properties. It is an excellent electrical insulator and at the same time a fairly good conductor of heat; it expands and contracts to the same extent as the ironing base. It is set around the resistance wire with a hydraulic pressure of 65 tons and is then baked solid at a temperature of 1,400 degrees. The heating element is therefore hermetically sealed against any access of air, since its co-efficient of expansion is the same as that of iron, which eliminates the liability to crack. The adjacent portions of the coil are separated by one-sixteenth inch of this composition which is said to be seven times more than necessary to prevent short-circuiting.

Dover No-burn-out Electric Iron.

The company is so confident of the absolute durability of this element that it gives the iron an unlimited or, as it is termed, an everlasting guarantee. During the Panama-Pacific International Exposition, where both of these irons were on display, one of these heating elements was kept continually energized from the time the Exposition opened in February until it closed in December, which is said to be the equivalent of over 100 years of average family use. This particular element has shown no trace of deterioration and is believed to be as good as new. This iron and the company's Abesto automatic iron were awarded the only gold medals for electric irons at the Exposition.

Above the heating elements of each of these irons is a heat-storage reservoir in the shape of an iron block and between this and the hood is an air space which decreases the radiation upwards. The Dover non-automatic iron has a six-foot cord with detachable plug. The plug end that is connected to the iron is protected by a rigid steel clamp and spring coil. The plug has extra long spring contacts. The Abesto automatic iron has its cord permanently attached. Each iron is supplied with a three-ply electrically welded steel stand. In the upper surface of this there is a groove that can be used for receiving an ordinary curling iron. A waxer and cleaner is also supplied with each iron. A small truss attachment can be added to the stand by means of which the iron can be inverted and used as an electric stove.

Special 2.5-Pound Telephone for Forest Rangers.

A portable telephone, made of aluminum and weighing only 2.5 pounds, the invention of a United States forest officer, R. B. Adams, of Missoula, Mont., will be part of the regular equipment of patrolmen in the National Forests during the coming field season. This instrument is regarded as a great improvement over the set formerly used, which weighed 10 pounds.

It is said that a field man equipped with this telephone, a few yards of light emergency wire, and a short piece of heavy wire to make the ground connection can cut in anywhere along the more than 20,000 miles of Forest Service telephone lines and get in touch with the headquarters of a supervisor or district ranger. To talk, one end of the emergency wire is thrown over the telephone line, the two ends are connected to the portable instrument, and the instrument is connected to the ground wire, the end of which must be thrust into the damp earth or in water. Contact with the line wire is made possible by removal of the insulation from a few inches of the emergency wire.

The Adams instrument does not ring the bell of the receiving telephone, but instead causes a screeching sound from a small megaphone-shaped apparatus, descriptively known as a "howler." This instrument is installed at the ranger station telephone and is said to give effective notice that some one is on the wire. If the field man needs to talk with some one elsewhere on the line, the ranger station instrument can be used to ring up the person wanted, when the conversation can be carried on.

Forest officers say that these portable telephones are especially valuable in reporting fires and other emergencies with the least possible delay, and also in sending instructions to field men and keeping the district rangers informed as to the progress of work going on in the field, thus supplementing the regular telephone sets installed at lookout points, ranger stations, and at convenient intervals along Forest Service roads and trails.

Automatic Motor-Operated Switching Apparatus for Connecting Emergency Power Source.

For many purposes electric power supply must be made positively reliable and continuous. This is particularly true for signal purposes. If direct current is supplied, an emergency or auxiliary source of great reliability can be provided in the form of a storage battery. However, where alternating current is supplied, a storage battery can act as an auxiliary only through a rather complicated set of control equipment including either a reversible rotary converter or motor-generator. If two independent alternating sources are available, one used as the normal supply and the other as the emergency only, the likelihood of failure of both sources at the same time is rather remote. What is desired in this case is a dependable means of automatically changing from the normal source of supply, in case of failure thereof, to the auxiliary or emergency source.

Such a means has been provided through the invention by C. W. PenDell, of the Public Service Company of

Northern Illinois, of an automatic switching system, which was designed primarily for use in connection with railway signal circuits that are supplied from alternating-current power transmission lines. An installation of this apparatus has been made in an automatic substation along the Grand Trunk Railway, at Elsdon, Ill. Fig. 1 shows a view in the corner of this substation. Figs. 2 and 3 are front and back views of the control and motor mechanism for opening and closing the oil switch.

The mechanism consists of a single-phase repulsion-type induction motor connected through a set of mechanical parts that transmit the power of the motor to the oil-switch-closing mechanism; there is also provision for adjusting the time interval between energization of the motor and closing of the switch; a low-voltage release to trip out the switch and a means to prevent the switch from closing, if energy is restored to the line from another source before the mechanism has completed its operation, are also included in the set.

The motor receives its power through the contacts of a low-voltage relay, which is de-energized when power on the signaling system or supply bus fails. The power of the motor is transmitted through a worm gear and pinion to the pawls which move the ratchet. In Fig. 2 this is shown as the mechanism is just beginning to operate and in Fig. 3 the view from the opposite side shows the position of the mechanism just after the switch has been closed. One of the pawls works on an eccentric from the pinion shaft and the other is fastened concentric to the shaft. For each revolution of the pinion the eccentric pawl moves the ratchet the space of one tooth and the other pawl holds the ratchet in this position, while the former is reaching forward to another tooth. Each movement from tooth to tooth consumes two seconds. The ratchet may be set to start the motion on any tooth so that the time interval between energizing the motor and closing the oil switch may be adjusted by two-second increments from two to thirty seconds.

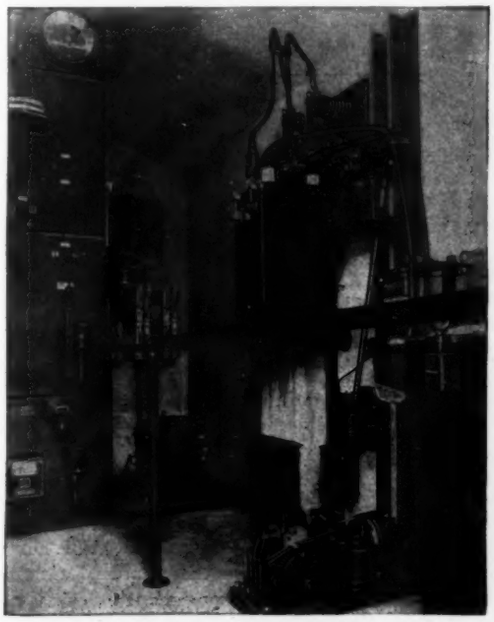


Fig. 1.—Automatic Motor-Operated Switching Mechanism in Substation.

The first movement of the ratchet closes the fingers of the auxiliary switch which relieves the relay contacts from heavy current; the final movement simultaneously raises the weight of the low-voltage release and closes the oil switch.

When the latter closes, energy is restored to the potential relay and to the magnet that lifts the pawls. This allows the ratchet to return to normal position and the auxiliary switch to open, but the oil switch does not open because the connected link attached to its operating rod is held by the trigger latch. The oil switch is tripped out only when the low-voltage release is de-energized. The restoration of service through one equipment energizes the potential relay and the pawl-lifting magnet of the mechanism that controls the other source of supply. This immediately stops further operation of the mechanism, all parts being restored to normal and the switch not closed.

The time-element adjustments on the mechanisms controlling two power sources supplying, for instance, a signal bus or other load, are set to give one source the preference. Thus, if the mechanism controlling the normal source is set for, say four seconds' delay, and that the emergency source for 30 seconds, the normal source will be reconnected to the service before the emergency source, in case of a momentary interruption. Should the interruption continue beyond the time set for the emergency source, the latter will be connected to the service and the normal source blocked out until it is again fully available, when it will trip out the switch on the emergency supply by means of the low-voltage relay which is energized from the normal source and short-circuits the release coil of mechanism on the emergency supply.

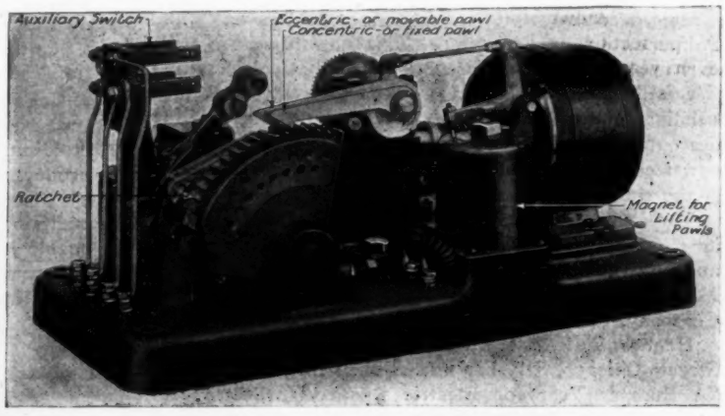


Fig. 2.—Automatic Motor Mechanism Beginning to Operate.

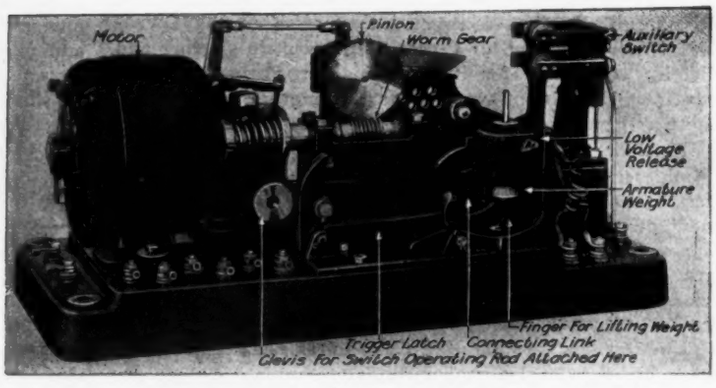


Fig. 3.—Opposite View of Mechanism Just After Operation.

This system is adaptable to a great many classes of load where continuity is very important. Although the equipment described is all of the single-phase type, it can be adapted to polyphase circuits. This equipment is manufactured by the General Electric Company.

INDUSTRY ACTIVITIES

Hazard Manufacturing Company, Wilkes-Barre, Pa., has issued a 16-page booklet on Keystone railroad signal wire, processes of construction and the characteristics of Keystone insulation being given.

Bleadon-Dunn Company, 208 North Fifth Avenue, Chicago, Ill., manufacturer of "Violetta" high-frequency generators for medical use, is distributing mailing folders describing and illustrating the device.

Ward Leonard Electric Company, manufacturer of electric controlling devices, has removed its offices in Pittsburgh, Pa., to 901 Park Building. John B. Sebring remains as the company's Pittsburgh representative.

Globe Stove & Range Company, Kokomo, Ind., has issued a revised edition of its series of four folders on "Talking Points on Globe Electrics." This new literature will be sent upon request to those interested in electric ranges.

General Electric Company is soon to erect a new factory building at Providence, R. I., for the manufacture of incandescent lamp bases. About 500 will be employed in the new factory, which will be completed during the latter part of the summer.

The Protean Electric Sign Company has been organized at Kansas City, Mo., with E. J. Kampf as vice-president and general manager to install and operate in Kansas and Missouri the "talking signs" of the Peerless Electric Sign Company, of Dayton, Ohio.

Hughes Electric Heating Company, 211 West Schiller Street, Chicago, Ill., has issued a mailing folder entitled "A Bumper Year for Electric Ranges." Illustrations of latest types of Hughes ranges are given, together with a reprint of an article on building up a range load.

Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., has contracted to furnish to the Owen-Schoeneck Company, of Chicago, Ill., electric starting and lighting equipments for its six-cylinder trucks. The equipments will consist of type 750 starting motors and type 202 lighting generators.

Kandem Electric Company, formerly the Koerting & Mathiesen Company, has recently moved to larger quarters at 29 East Twenty-first Street, New York City. The new offices are much more spacious, and large storage space forms part of the new facilities. An increased demand for "Excello" arc lamps and for fans and other devices which the company handles made this change necessary.

Underwriters' Laboratories, Chicago, Ill., has issued a 32-page booklet on electrical data. The contents include descriptions of its New York City testing station, a ten-cent electric toaster, motion-picture equipment and labeling of slow-buning films, dental panelboards, electrically heated pads, foot-warmers and blankets, steel or brass-coated iron in electrical fittings, and fires and accidents due to electrical causes.

The Mohrlite Company, Urbana, O., manufacturer of electric-lighting fixtures, has prepared a very attractive catalog of its line of indirect and semi-indirect fixtures, which are of a self-contained type. The light is projected by a diffuse reflector upon a cone-shaped diffusing surface, which forms the upper part of the fixture placed on the ceiling. The patented curves and reflecting surface are designed to distribute an even illumination over a wide area and the interior reflectors being the only constant there is a wide range for originality in design.

Sangamo Electric Company, Springfield, Ill., manufacturer of meters, is planning the erection of a $100,000 addition to its main factory at Eleventh Street and Converse Avenue. The building will be three stories high, with four-story wings at each end.

Brassart Fixture Company, 13 Laight Street, New York City, has prepared 70 half-tone sheets, showing a complete line of electric-lighting fixtures, and a 46-page catalog of gas-lighting fixtures. Copies of either or both catalogs will be mailed upon request to electrical or fixture dealers.

Westinghouse Church Kerr & Company, engineers and constructors, 37 Wall Street, New York, N. Y., has issued a folder which describes in pictures the construction of the new plant of the Taylor-Wharton Company at Easton, Pa., a plant arranged to permit of many operation and production economies.

General Insulate Company, 1008 Atlantic Avenue, Brooklyn, N. Y., manufacturer of "Insulate" and "Hi-Heet" molding compound, has established such a demand for its products that it has just broken ground for an addition to its present building in Brooklyn and has contracted for additional equipment which will increase its plant and will enable it to more than double its present capacity. Some departments have been working nights and holidays for some time past, though none of the output, the company's officials state, is "war business," but to supply domestic trade.

Edison Storage Battery Company branch-office managers and salesmen gathered at the company's factory and main office in Orange, N. J., March 13-17 for the annual sales meeting. H. G. Thompson, vice-president and general sales manager, presided. The reports of the various salesmen showed a healthy condition throughout the industry and marked important developments made by the Edison storage battery. The success of the Hartford Electric Light & Power Company, using the Edison storage battery service system, and the fact that the company was able to charge lower rates than charged by any other company was pointed to as information which should be more clearly brought to the attention of other central stations interested in securing off-peak load.

The Chicago Fuse Manufacturing Company, of Chicago and New York, is sending out a new catalog describing the "Union" line of electrical supplies. This company previously published separate catalogs for fuse material and for switch and outlet boxes, but the present No. 28 Edition combines both in an attractive book of 132 pages, divided into four sections. All descriptions have been revised and many new features introduced to make a handy reference guide for the buyer's desk. National Electrical Code fuses, cutouts and fittings are shown in Section 1; "old Code" fuses in Section 2; auto fuse material, telephone and open fuses in Section 3; and stamped-steel outlet boxes and covers and switch boxes in Section 4. The principal outlet boxes are illustrated with half-tones, while small line cuts illustrate every cover opposite its description. A reference list of other manufacturers' corresponding numbers is given for outlets, fuses and cutouts. All of the extensive "Union" line of switch boxes are illustrated, together with four styles of mounting ears, and as many forms of clamps. Descriptive and numerical indexes complete the book, which is attractively printed and neatly bound in flexible covers.

PERSONAL AND BIOGRAPHICAL

MR. J. S. RICKARD, formerly connected with the Metropolitan Engineering Company, of New York City, has joined the sales organization of the Philadelphia Electrical & Manufacturing Company, and will devote his time to the sale of Pemco products.

MR. L. G. BRIDGER, who has been the Iowa representative of the Northwestern Electric Equipment Company, of St. Paul, Minn., for the past seven years, has resigned and joined forces with the Midland Electric Company, of Mason City, Iowa, whose business outlook for the ensuing year is sufficiently encouraging to warrant an increase in its selling organization.

MR. R. S. WALLACE, vice-president and general manager of the Central Illinois Light Company, Peoria, Ill., and president of the Illinois State Electric Association, underwent an operation for appendicitis last week at a hospital in Peoria. At the time of going to press it was reported that Mr. Wallace was progressing very nicely, and his friends will be glad to look forward with him to an early recovery.

MR. D. W. ROPER, who recently was elected vice-president of the Electric Club-Jovian League, Chicago, Ill., is superintendent of the street department of the Commonwealth Edison Company, Chicago. Mr. Roper was graduated from Cornell University in 1893, after which he accepted a position with the National Electric Company, of Eau Claire, Wis., later resigning to take the students' course of the General Electric Company at Schenectady. Later he was in station-operating work at Niagara Falls, N. Y.,

D. W. Roper.

and in 1897 joined the staff of the Missouri Edison Electric Company at St. Louis. After supervising the installation of the underground conduit system and the removal of the overhead wires, Mr. Roper was appointed superintendent of electrical equipment in 1899, his duties being gradually extended to include the supervision of all electrical construction and operating work. In 1903 Mr. Roper became connected with the old Chicago Edison Company, now the Commonwealth Edison Company. In 1904 he was appointed assistant to the chief operating engineer, his work involving special attention to the design, construction and operation of the underground distribution system, and in 1915 Mr. Roper was given the title of superintendent of the street department.

MR. ADDIS M. WHITNEY, treasurer and director of the Massachusetts Lighting Companies, has resigned as treasurer, to take effect April 22, and as trustee, effective June 1. Mr. Whitney has been connected with the organization since its beginning in 1903, being treasurer and director since that time. Before that he was treasurer and director of several gas and electric companies, and has since held similar positions in 32 separate organizations. Mr. Whitney will take up other lines of work in territory not covered by the Massachusetts Lighting Companies, it is announced.

MR. J. M. WAKEMAN, general manager of the Society for Electrical Development, has been appointed by Jupiter Thomas A. Wynne, a Statesman-at-Large of the Jovian Order. Mr. Wakeman is one of the old-time Jovians, his Potential being 524. He was Supreme Apollo in the Fifth Constellation, and in appointing Mr. Wakeman as Statesman-at-Large, Jupiter Wynne writes that "the appointment is made with the feeling that the Society for Electrical Development and the Jovian Order will be in close touch and will co-operate with one another to the fullest extent." The work of both these organizations being strictly co-operative in its character, although along different lines, it is eminently fitting that the general manager of the one should be recognized by this important appointment in the other.

MR. A. D. FISHEL, former manager of the distributing transformer section of the supply department of the Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., has been appointed commercial manager of the Adams Bagnall Electric Company, Cleveland, O. Mr. Fishel is a graduate of the public and high schools of Cleveland, and also of Case School of Applied Science of that city. He entered the engineering apprenticeship course of the Westinghouse company in 1909, two years after his graduation, and was engaged in general engineering and detail sales work until 1912, when he became head of the transformer division, which position he held until his recent transfer to Cleveland. Mr. Fishel is an associate member of the American Institute of Electrical Engineers, Jovian Order and other electrical societies, and is well known in the electrical industry.

MR. L. H. KELLER, who for the last three years has been manager of the Chicago district office of the Moloney Electric Company, is moving to St. Louis, Mo., where he is being advanced to an executive position in the general offices of this company. Mr. Keller has been with the Moloney Electric Company ever since he was graduated from the University of Missouri in 1912. He has a wide acquaintance in the Middle West and for the past three years has been very active in electrical and allied organizations. While his loss will be keenly

L. H. Keller.

felt by his many Chicago friends it is realized that Mr. Keller's promotion is a well deserved one and they unite in extending best wishes for his continued success. MR. RALPH B. COLEMAN, who has been traveling out of the Chicago office, will succeed Mr. Keller as manager.

OBITUARY.

DR. ERIC GERARD, for many years one of the foremost professors of electrical engineering, and who had the distinction of being the first person to teach electrical engineering as a separate subject, died in Paris, France, March 27. Dr. Gerard was born in Liege, Belgium, September 22, 1856.

DR. HARRY C. JONES, professor of physical chemistry at Johns Hopkins University and a recognized authority on that subject in the United States, died at Baltimore, April 9, 1916, from apoplexy. He was editor of and contributor to numerous scientific journals and was the Longstreth medalist of Franklin Institute in 1913. His principal works were "Freezing Point, Boiling Point and Conductivity Methods" and "The Modern Theory of Solutions," and he was the author of "Outlines of Electro-Chemistry," published in the ELECTRICAL REVIEW in 1901. In this field Dr. Jones was one of the earliest authorities and a pioneer in respect to many ideas suggested in that classical work. His book entitled "Electrical Nature of Matter," published in 1906 and revised in 1910, was widely read and adopted as a text-book in a number of educational institutions. He possessed a magnetic personality and his students and fellows were warmly attached to him. Dr. Jones was a graduate of Johns Hopkins and had studied at Leipsic, Amsterdam and Stockholm.

CURRENT ELECTRICAL NEWS

Weekly Record of Construction Activities

EASTERN STATES.

RUMFORD, ME. — The Maine Coated Paper Company, which operates its machines entirely by electric power, is about to make an addition to its plant costing about $200,000. The Oxford Paper Company, another large user of electric power, is now completing a large addition.

CAMBRIDGE, MASS.—The City Council has passed an order providing for the appointment of a special committee to investigate the problem of municipal lighting and to consider the advisability of the purchase of the plant of the Cambridge Electric Light Company or the establishment of a municipal plant.

PEABODY, MASS.—The finance committee has recommended that the town raise $40,000 for the purpose of enlarging the equipment at the electric-lighting plant, the maturing bonds and interest to be paid from the receipts of the department.

ROCHESTER, N. Y.—Work will soon begin on the new power station of the Rochester Railway & Light Company in Leighton Avenue. The building will be two stories, 60 by 40 feet.

WATERTOWN, N. Y.—The New York Air Brake Company has prepared plans for the erection of two power plants, one to be located at the West Main Street factory and the other at the East factory. It was announced that the capacity of the former plant will be 1,200 horsepower, and it will be completed about July 1. Work on the latter plant wil start August 1, this plant to be of somewhat larger capacity. Contracts have been let to the Samuel Green Engineering Company, of Springfield, Mass., for the construction work.

ATLANTIC CITY, N. J.—General Manager Montgomery, of the Atlantic City Electric Company, has announced that the company has commenced the construction of a transmission line between this city and Ocean City. The new line, which will cost about $75,000, will connect the plants in the two cities, and it is planned to have the Ocean City plant for emergency use only. There will be a submarine crossing at Great Egg Harbor Bay.

BAYONNE, N. J.—The Vacuum Oil Company will build a new reinforced-concrete power plant at its oil refining works.

TOMS RIVER, N. J.—The Ocean County Electric Company has been granted permission by the Board of Public Utility Commissioners to issue stock for $370,000, the proceeds to be used for the construction of a hydroelectric power plant on the Toms River.

TRENTON, N. J.—Following a conference of engineers, announcement is made that the Trenton Water Power Company will immediately renew construction work on the proposed power plant at the junction of the Sanhican and Assunpink Creeks, an industrial section adjacent to the Delaware River. The project was temporarily abandoned during the period of depression more than a year ago.

TRENTON, N. J.—By the adoption of House Bill No. 315 by the State Legislature, and its formal approval by the Governor, the city of Trenton is arranging for the installation of an extensive street-lighting system. The new system will be placed along State, Broad and Warren Streets, with extensions along adjacent streets. The city will purchase the necessary poles, lamps and auxiliary equipment. Electric energy will be supplied by the Public Service Electric Company, which will also keep the system in repair.

CATASAUQUA, PA.—Borough Engineers Bascom & Sieger have been authorized by the Council to secure data relative to the construction and operation of a municipal electric light plant for Catasauqua.

DARLINGTON, PA.—The Harmony (Pa.) Electric Company is erecting a transmission line from Koppel to this city, and later will extend the line to Lisbon, O.

LEBANON, PA.—Thomas L. Becker, of Millbach, Oscar Witter, of Newmanstown, and Frank P. Hammer, of this city, are members of the directorate of the new Lancaster & Berks Street Railway Company, which proposes to effect through trolley service from Reading to Lebanon by the construction of a line between Womelsdorf in Berks County and Lititz in Lancaster County.

MARCUS HOOK, PA.—A municipal electric-lighting plant is being planned for this city.

MT. AETNA, PA. — Applications have been made for charters by the Marion Electric Company, to supply light and heat to residents of Marion Township, and by the Mt. Aetna Electric Company, to supply lighting and heat in Tulpehocken Township. Each company will be capitalized at $5,000.

READING, PA.—Application has been made to the Public Service Commission for approval of a contract between the Metropolitan Electric Company and the city for supplying power for the operation of the city's disposal plant at Canal and Sixth Streets.

BALTIMORE, MD.—In his annual report, Lighting Superintendent Mohr announced the work for 1916 will include the installation of 300 arc lamps, 300 incandescent lamps, 25 250-watt nitrogen filled lamps, and the changing of 500 lamps from the overhead to the underground service.

VIRGILINA, VA.—Plans are well under way for the establishment of a municipal electric-light system.

WHEELING, W. VA.—The City Council is planning to make improvements and extensions to the city lighting system.

ST. GEORGE, S. C.—Plans are being prepared for the establishment of a municipal electric-lighting plant, $5,000 in bonds having been voted for the purpose.

NORTH CENTRAL STATES.

ALLIANCE, O.—A corporation is being organized to construct an interurban electric railway between Salem and Youngstown, extending through the village of Canfield. John Goeppinger, of Alliance, is interested in the plan.

ASHTABULA, O.—About 20 property owners of Windemere and Lynnhurst have signed petitions asking the Cleveland, Painesville & Ashtabula Electric Railway Company to supply lighting service.

BAREERTON, O.—Extensive additions to the city lighting plant are recommended by Superintendent R. E. Long to enable it to meet the demand for energy, a new building and power equipment estimated to cost $43,769 being suggested. The two power units at present constituting the plant are operated regularly, without reserve equipment, and it is anticipated that when a heavier demand begins next fall the plant will not be able to supply the current needed.

BATAVIA, O.—Extensions and improvements to the municipal distribution system are being considered.

DESHLER, O.—The question of issuing bonds for the establishment of a municipal electric-lighting plant will be submitted to the voters May 10.

HICKSVILLE, O.—The purchase of the plant of the Hicksville Lighting & Power Company has been completed by the Northwestern Ohio Light & Power Company, of Van Wert, O., for about $100,000. The company plans extensions of the service to cover a number of towns not now reached by electric lines.

KENT, O.—The city has been considering plans for the construction of a municipal electric plant, but will suspend definite action pending consideration of a proposal from the Kent Water & Light Company, now serving the city, for the installation of additional street lights and other concessions. About 400 bracket lamps for the residence section and a modern system for the business district will be placed by the company, if its offer is accepted.

RAVENNA, O. — Power and pumping equipment will be required in connection with the new city waterworks, to be constructed in the vicinity of Muzzy Lake. R. W. Pratt, of Cleveland, has been recommended by Service Director Linton to have charge of the engineering work on the plant. Plans have not yet been decided upon.

INDIANAPOLIS, IND. — The Merchants Heat & Light Company soon will begin alterations and additions to its plants that will cost about $280,000 has been announced by A. W. Higgins, general manager. The changes include a new brick stack, 300 feet high, at the West Washington Street plant, new boilers, engines and stokers, and new brickwork for the new equipment. There also will be changes and improvements at the Pearl Street, the Alabama Street, the Court Street and the Talbott Avenue stations. Contracts have been awarded for a Westinghouse 6,250-kilowatt turbogenerator and other equipment.

BEMENT, ILL.—The Bement Electric Light & Power Company, W. J. Day, manager, is planning to erect a transmission line to Ivesdale and furnish electric service there.

GALVA, ILL.—At a meeting of the board of directors of the Commercial Club it was decided to place cluster lights along the streets where paving is to be done.

GENESEO, ILL.—Plans are being made by Mayor H. R. Ott and other city officials for erecting a municipal lighting plant.

JACKSONVILLE, ILL.—On May 12 citizens here will vote on a $100,000 bond issue, part of which will be used to improve the city electric-lighting plant.

LITCHFIELD, ILL.—The plant of the United Gas & Electric Company has been purchased by the Southern Illinois Light & Power Company, of Hillsboro, Ill., the sale having been approved by the Public Service Commission. It is rumored that the plant here will be enlarged and that electrical energy for light and power will be supplied to a number of neighboring towns.

LORAINE, ILL.—The Loraine Electric Light & Power Plant of Loraine has been incorporated with a capital of $2,500 to furnish light and power to this city. B. Van Blair, A. Van Blair and W. R. Hastings are the incorporators.

MANCHESTER, ILL.—Plans are being discussed here by city officials for securing electric lighting.

PAXTON, ILL.—The Central Illinois Utilities Company, of Paxton, N. J. Boisen, manager, is planning improvements to its plant at Fairbury.

SPRINGFIELD, ILL.—Plans insuring the completion of the Springfield & Jacksonville electric railway during 1917 have been completed, according to officials here. J. H. McFarlane, of Springfield, general manager of the company, which was organized in 1910 to build the line, has announced that the work is to be commenced soon.

GREENVILLE, MICH.—Bonds in the sum of $5,000 have been voted for a boulevard lighting system here.

HANCOCK, MICH.—The lighting committee of the City Council is planning to improve the street-lighting system. It is proposed to replace 44 arc lamps with tungsten lamps.

HOUGHTON, MICH. — The Houghton County Electric Light Company is planning a number of plant extensions and improvements to be made during the coming summer. A turbogenerator, boilers and auxiliary equipment will be added. Plans for the proposed improvements have been prepared and bids will be asked for shortly. The plant is under the management of Stone & Webster, 147 Milk Street, Boston, Mass.

HOWARD CITY, MICH.—Franchises for the purpose of supplying electrical energy in the various communities in Montcalm County are being secured by F. E. Hatch, of Detroit, and W. C. C. Clark, of Pontiac. The former has secured 30-year franchises in Morley, Sand Lake and Pierson and is

seeking similar franchises in Aetna, Deerfield, Winfield, Pierson and Maple Valley townships. Mr. Clark has secured a franchise to operate in Edmore and is seeking franchises in Stanton, Sheridan, Six Lakes and Crystal.

MONROE, MICH.—At a city election held last week, the voters approved the issuance of $90,000 in bonds for the installation of an electric-lighting plant.

ST. JOSEPH, MICH.—A new electric railway line from this city to Michigan City is being planned by M. W. Stock and others.

CHIPPEWA FALLS, WIS.—Work on the construction of the Wissota dam of the Wisconsin-Minnesota Power Company on Paint Creek is well under way. Several million feet of lumber have been used for the cofferdams and molds for the concrete work.

LACROSSE, WIS.—Plans are being made for an extension of the white way system on North Third Street.

BEMIDJI, MINN.—The City Council is planning to install a white way system in the business district.

VIRGINIA, MINN. — Chairman A. G. Flournoy of the public welfare committee of the Commercial Club has appointed a committee to make plans for a white way on Chestnut Street.

WADENA, MINN.—Bonds in the sum of $11,000 have been voted for extensions to the electric-lighting and water plant. A new 100-kilowatt generating unit will be purchased.

ADAIR, IOWA.—The City Council has completed negotiations for the sale of the municipal electric-lighting plant to John A. Reed for $12,500. The proposition will be submitted to the voters April 24.

DIAGONAL, IOWA.—The Council is planning ways and means to secure a municipal electric-lighting system.

DOW CITY, IOWA.—The city is contemplating the purchase of an emergency generating unit, to be driven by a 25-horsepower oil engine, for the municipal plant, of which H. G. McQueen is superintendent.

HOPKINTON, IOWA.—W. A. Milroy, owner of the local electric-lighting plant, plans to install additional generating equipment.

VINTON, IOWA.—Plans for improvements to the municipal electric-lighting and waterworks systems call for an expenditure of about $15,000.

KANSAS CITY, MO.—The Kansas City Light & Power Company has purchased land at Twenty-first and Walnut Streets, for $125,000. It is understood the tract will be used for the heating plant which the company has heretofore maintained downtown. The company may ultimately install its own plant for generating electricity.

PIERCE CITY, MO.—A proposal to sell its municipal electric-lighting plant and buy energy from the Ozark Power & Water Company, of Joplin, has been approved by voters here. The company has offered to pay $6,000 for the plant and seeks a 20-year franchise.

PLATTSBURG, MO.—E. B. Murray Engineering Company, Kansas City, Mo., has been instructed by the City Council to prepare plans for a waterworks system and a sewer system for Plattsburg, the entire improvement to cost about $58,000. Bids on the waterworks system probably will be asked in 30 days.

SPRINGFIELD, MO. — The Lawrence County Light, Power & Cold Storage Company, which buys current from the Ozark Power & Water Company, has made a contract for the electrification of the properties of the Union Mining Company, at Aurora. This is the first electrification in the Aurora district. The contract will make necessary additional generators for the power company, the estimated expenditures being about $275,000. The mining company will, it is said, spend about $5,000 a year for power.

KANSAS CITY, KANS.—Commissioner L. H. Chapman has recommended the transfer of $20,000 of the earnings of the municipal electric-lighting plant to the extension fund. The money will be used for extensions to the distribution system.

LEWIS, KANS.—A. L. Moe, proprietor of the Kinsley (Kans.) Electric Light & Power Company, has submitted to the Council a proposition to build a transmission line from his plant to Lewis, install 50 street lights and build such lines as are necessary to the city. In return Mr. Moe asks that the city hold an election and vote bonds to the amount of $10,000.

PRATT, KANS.—At a city election held last week a bond issue of $23,000 to purchase the old electric-lighting plant was carried. The plant will be consolidated with the municipal plant.

DATES AHEAD.

American Electrochemical Society. Semi-annual meeting, Washington, D. C., April 27-29. Secretary, J. W. Richards, Lehigh University, South Bethlehem, Pa.

Iowa Section, N. E. L. A. Annual meeting, Dubuque, Iowa, May 10-12. Secretary, W. H. Thompson, Jr., Des Moines, Iowa.

Missouri Association of Public Utilities. Annual convention, May 11-13, on board boat leaving St. Louis May 11. Secretary, F. D. Beardslee, 315 North Twelfth Street, St. Louis, Mo.

Southwestern Electrical and Gas Association. Annual convention, Galveston, Tex., May 17-20. Secretary, H. S. Cooper, 405 Slaughter Building, Dallas, Tex.

National Electric Light Association. Annual convention, Chicago, Ill., May 22-26. Secretary, T. C. Martin, 29 West Thirty-ninth Street, New York City.

Gas, Electric and Street Railway Association of Oklahoma. Annual convention, Oklahoma City, Okla., May 23-25. Secretary, H. V. Bozell, Norman, Okla.

Arkansas Association of Public Utility Operators. Annual convention, Little Rock, Ark., June 6-8. Secretary, R. B. Fowles, Pine Bluff, Ark.

National Electrical Contractors' Association of the United States. Annual convention, Hotel McAlpin, New York City, July 18-22. Secretary, G. H. Duffield, 41 Martin Building, Utica, N. Y.

SYLVIA, KANS.—Bonds in the amount of $5,000 have been voted to secure electric service here. A transmission line probably will be erected to Stafford for the purpose.

COLERIDGE, NEB.—The new municipal electric-lighting plant will soon be in operation. The machinery has been installed and most of the line work completed.

FLORENCE, NEB.—On April 18 the proposition to issue $10,000 in bonds for the establishment of an electric-lighting plant will be submitted to vote.

MERNA, NEB.—Improvements will be made to the electric-lighting and waterworks system, $9,000 in bonds having been voted for the purpose.

STELLA, NEB.—An accident to the engine in the municipal electric-lighting plant has placed the plant out of commission. The town will be without electric light unless some private company takes over the plant.

WINNEBAGO, NEB.—John Ashford, M. S. Mansfield and O. E. Buckley have been appointed by the Council to secure an electric-lighting system for this city.

ELK POINT, S. D.—Improvements and extensions are being planned for the municipal electric-lighting plant.

FAULKTON, S. D.—The Faulkton Light & Power Company, Oscar Edwards, manager, contemplates the installation of two additional generating units and proposes to establish a 24-hour service.

HOWARD, S. D.—Plans are under consideration for the purchase of the local electric-lighting plant by the city.

LEMMON, S. D.—E. F. Sheets has purchased the local electric-lighting and power plant from the Security Investment Company and is planning to supply 24-hour service.

REDFIELD, S. D.—Redfield will construct a modern municipal lighting, heating and power plant to cost about $75,000. It is expected to have the new plant fully completed and in operation before the first of the year. E. J. Bain is city clerk.

BURLINGTON, N. D.—A proposition to erect a transmission line to Foxholm for the purpose of supplying electric service to that city and intervening communities is being considered by the Northern States Power Company.

CLEVELAND, N. D.—An electric-lighting plant is now assured for Cleveland, the required money for construction having been subscribed.

SOUTH CENTRAL STATES.

CYNTHIANA, KY.—Mayor Swinford and Commissioners Conway, Wohlwender, Hatterick and Sprake, with City Manager Durbin, are making investigations of municipal lighting plants in connection with a proposal that the city enter the lighting field. The municipal plants at Falmouth and Winchester, Ky., have been inspected and further inquiries are to be made.

ELKTON, KY.—The South Kentucky Power Company holds an option until April 22 on the plant and franchise of the local electric light company owned and managed by Charles C. Damon, of Elkton.

GRAYSON, KY.—The Grayson Light & Power Company has been incorporated with a capital of $6,000 by J. A. Bagby, R. M. Bagby and others, and will furnish electric service here.

HAZARD, KY.—The Kentucky River Power Company has closed contracts, according to R. L. Cornell, manager, for equipment and erection of the power plant which it was announced last winter the company would build here. A five-acre site has been purchased in the eastern end of the city and construction will begin at once, the plant to be completed by October 1.

RUSSELLVILLE, KY.—The city, after consideration, has declined to sell its lighting and waterworks plants to the South Kentucky Power Company, which had asked for a proposal.

NASHVILLE, TENN.—The City Commission has passed an ordinance providing for the preparation of plans for a lighting system for the Woodland Street bridge.

ANNISTON, ALA.—The work on the foundation for the second electric furnace at the plant in Anniston is well under way, and it is understood that there is a prospect of the installation of four more furnaces of the same type, with probabilities of a further increase to ten. The Heroult furnace recently started up is doing excellent work and is meeting the expectations of the company's engineers.

ASHLAND, ALA.—A contract has been entered into between the City of Ashland and the Alabama Power Company, of Birmingham, by which the latter comes into possession of the lighting plant, now owned by the city, and energy will be furnished this place by the company after June. A transmission line from Talledega to Ashland will be erected.

BALDWYN, MISS.—A bond issue has been voted for the installation of an electric-lighting plant and improvements of the water system.

HIGHLAND PARK, TEX.—This community, which is a suburb of Dallas, has voted $10,000 in bonds for the purpose of securing electric lighting.

WACO, TEX.—City Electrician Ernest F. Copley estimates that the cost of the proposed white way system will be about $6,000.

WESTERN STATES.

ANACONDA, MONT.—Plans for the construction of a concrete dam at the city limits to form a small reservoir to control flood waters and serve as power for a contemplated municipal lighting plant have been completed by the city engineering department. The project will cost $25,000, according to estimates of the department, divided as follows: Dam and reservoir, $3,000; concrete lines, open ditch, $2,000; pipe, $11,731; excavation, 5,000 cu. yds., $5,000.

RED LODGE, MONT.—A project to build an electric railway system connecting Red Lodge, Bear Creek, Columbus and other points in Carbon County has taken definite shape. The proposed line would be about 40 miles in length and would cost about $500,000. F. W. Lyle is interested in the project.

WINSLOW, MONT.—The Winslow Gas & Electric Company has been incorporated to construct and operate a $50,000 plant.

SPRING CITY, UTAH.—Application has been filed with State Engineer Beers for rights to six cubic feet of water per second from Oak Creek for the purpose of constructing a municipal electric-lighting plant.

ROBERTS, IDAHO.—In a recent decision, the Public Utilities Commission at Boise decided against the Ashton & St. Anthony Power Company, Ltd., in the case of the village of Roberts vs. Ashton & St. Anthony Power Company. The certificate of convenience and necessity granted the Power Company to serve the village of Roberts was withdrawn. The Utah Power & Light Company, which is petitioning for the right to serve Roberts, is preparing to enter the field within 60 days after the Public Service Commission grants it the right. The Ashton & St. Anthony Company, however, still holds the right to serve territory in the vicinity of Roberts, and has already begun the construction of its dam and power house about two miles west of Ashton, where a 5,000-horsepower plant is under construction.

WALLACE, IDAHO.—A franchise has been granted the Washington Water Power Company, of Spokane, Wash., by the City Council, giving the company permission to construct, operate and maintain electric transmission lines over certain streets in Wallace, through to the city limits, where the company will furnish current to several mining camps on Placer Creek. The

installation will be made as soon as materials can be purchased and delivered.

EVERETT, WASH.—Rucker Brothers, of this city, owning the majority of the stock of the Western Water Power Company, in a recent proposition to Superintendent J. D. Ross of the Seattle municipal lighting plant, offered to develop the Deer Creek-Lake Cavanaugh Power project in Snohomish County, and sell same to the city. In their offer, it is asserted the development of the project would involve the diversion of the waters of Deer Creek into Lake Cavanaugh by means of a flume and tunnel, the flume to be 19,200 feet long, and the tunnel 3,600 feet long. Five dams would be constructed to impound the water. From the south end of the lake the water would be carried by two tunnels, 8,020 feet long and 2,390 feet long. The second tunnel from the south end would carry the water to the penstock to a proposed power house in the Stillaguamish Valley, near Cicero. The proposed plant is approximately 70 miles north of Seattle.

NORTH YAKIMA, WASH.—The local land office has received information that the United States Land Office has withdrawn a power site consisting of 1,137 acres on the headwaters of the Klickitat River, near the slopes of Mount Thomas. The withdrawal was made on the recommendation of the Geological Survey. This withdrawal, it is stated, will interfere considerably with the projected power development of the Klickitat Power & Irrigation Company, which plans the development of Horse Heaven land. The Power Company plans utilizing the water from the Big Muddy and Klickitat Rivers in watering these lands.

OAKVILLE, WASH.—The plan of the Council to purchase from Frank Leisner the local electric light plant has been abandoned, according to reports.

OREGON CITY, ORE.—A special meeting of the City Council will be held shortly for the discussion of the practicability of a municipal electric-lighting and power plant.

PORTLAND, ORE.—The Home Telephone Company has agreed to pay a fine of $500, assessed by Judge McGinn in 1911, for failure to follow the provisions of the city ordinance regulating the installation and maintenance of overhead wires, and has also agreed to immediately begin the installation of its wires underground. The company plans to have 80 per cent of its lines underground in four years, and where hazardous conditions exist will place the wires underground within one year. J. B. Middleton is manager of the company.

RIDDLE, ORE.—A. E. Brais has been granted a franchise to construct and operate an electric distribution system here.

BAKERSFIELD, CAL.—After investigating the new electrolier street lighting system in Fresno, City Manager Morgan estimates that a similar system, consisting of 156 lights, could be installed here for $19,000.

LOS ANGELES, CAL.—Property owners along West Adams Street, between Hoover and Figueroa Streets, have been granted a permit by the Board of Public Works to erect an ornamental lighting system.

SACRAMENTO, CAL.—The State Water Commission has granted an application of the Pacific Power Corporation for a water appropriation from Leevining Creek in the Mono Lake basin. The water is sought for power purposes and involves an investment estimated at $717,144. The grant stipulates that construction shall begin by July 1.

SACRAMENTO, CAL. — Because wet weather has delayed the work of the Pacific Gas & Electric Company in Oak Park, the company will not complete its improvements in the annexed district until July, according to an announcement by C. W. McKillip, local manager for the corporation. The company is spending $30,000 on this extension of its system.

SAN FRANCISCO, CAL.—Ninety-nine per cent of the property owners on Market Street between East and Front Streets have entered into written agreements with the committee at work on the campaign for the installation of the Ryan system of illumination on Market Street, according to C. R. Hammersmith, of the Downtown Association, which has the campaign in charge.

WILMINGTON, CAL.—A petition from the Wilmington Chamber of Commerce, asking for electric lights in the residence district of Wilmington, has been referred to the Board of Public Works.

MANILA, P. I.—On the ground that the insular government's telegraphic service is unnecessarily expensive and cumbersome, Director R. M. Shearer, of the bureau of posts, has submitted to Commissioner De Veyra, acting secretary of commerce and police, a system for the general improvement of the telegraph, cable and wireless service, by means of which he proposes to place the telegraphic service on a satisfactory basis.

Foreign Trade Opportunities

[Addresses may be obtained from the Bureau of Foreign and Domestic Commerce, Washington, D.C., or its offices at Boston, New York, Atlanta, Chicago, St. Louis, New Orleans, Seattle and San Francisco. Write on separate sheet for each item and give file number.]

NO. 20537. ELECTRICAL GOODS.—A firm in India informs an American consular officer that it desires to be placed in touch with American manufacturers and exporters of electrical goods. Correspondence may be in English.

NO. 20565. ELECTRICAL SUPPLIES.—An American consular officer in England reports that a firm in his district desires to receive, catalogs and price lists from American manufacturers of shade carriers, with cord grip and bayonet lamp holder; electric bells and fittings, flexible wires, bell wire, electric vacuum cleaners, and other household electrical supplies.

NO. 20680. MACHINERY AND TOOLS.—An American consular officer in Norway reports that a firm in his district is in the market for large quantities of machine tools, steel tubing for electric conduits, electrical cables, copper tubing, etc. A complete list of the requirements of this firm, together with specifications and full information, may be examined at the bureau or its district offices.

NO. 20686. ELEVATORS.—An American consular officer in China writes that a department store in his district desires to receive catalog and full information for six-passenger elevators of the latest pattern, two to carry from 8 to 12 passengers, two from 10 to 12, and two from 5 to 6, all for buildings 4 and 5 stories high, together with crude oil motors and dynamos, one of 60 and two of 80 horsepower each. The firm wishes to deal directly with exporters and desires to secure an agency for the machinery it buys.

NO. 20711. TRAMWAY AND ELECTRICAL MATERIAL.—A commercial agent of the Bureau reports that a representative of a European tramway system is now in the United States for the purpose of establishing commercial relations with American manufacturers of all kinds of tramway and electrical material.

New Incorporations

MARION, IND.—Delta Electric Company has increased its capital stock from $25,000 to $65,000.

CHICAGO, ILL.—L. B. Lincoln Electric Works has increased its capital stock from $25,000 to $50,000.

WEST HOBOKEN, N. J.—Davis Tungsten Lamp Company, manufacture electric lamps. Incorporators: J. Davis, M. Davis and W. Perlis.

BIRMINGHAM, ALA.—Electric and Auto Supply Company. Capital, $50,000. Incorporators: T. H. Benners, C. D. Cotten and W. H. Manly.

STEUBENVILLE, O.—Multicell Electric Company. Capital, $10,000. Manufacture electrical devices. Incorporators: A. T. Howser, G. F. Hamilton and others.

NEWARK, N. J.—Electric Company, capital, $50,000; electrical contracting. Incorporators: A. H. and E. H. Koellhoffer, East Orange, N. J., and E. C. Worth, Newark.

TOLEDO, O.—United Electrical Manufacturing Company. Capital, $50,000. Manufacture electrical horns and apparatus. Incorporators: B. E. Hayes and E. J. Wagner; Detroit; Karl Wagner and Walter Haley, Adrian, Mich.

Financial Notes

Brush Electric Company, of Galveston, a subsidiary of Cities Service Company, has sold to Klem & Keen, of Philadelphia, $1,000,000 of its five-per-cent first-mortgage bonds.

Cleveland Telephone Company has sold to the First National Bank, of Cleveland, $3,000,000 five-per-cent two-year notes, subject to the approval of the Ohio Public Utilities Commission.

Gross receipts of Brooklyn Rapid Transit in March made a handsome gain of nearly $157,000 which compares with $115,000 in the 28 days of February and $154,000 in January. This was an increase slightly less than $5,100 per day during March.

It is officially announced that the Equitable Trust Company, as trustee of the first-mortgage bonds of West Penn Traction Company, has purchased and retired 51 per cent of the bonds and certifies that the outstanding funded debt of the company is now $5,536,000. The $6,000,000 three-year six-per-cent notes of West Penn Traction Company, due in 1917, will be called for payment at 100.5 and interest on September 1, 1916.

The Kings County Electric Light & Power Company has filed notice of an increase in its capital stock from $14,000,000 to $16,000,000. The increase is for the purpose of taking up $2,500,000 convertible bonds which were authorized to be issued by the Public Service Commission in December, 1912, the proceeds of which were used for certain corporate purposes. The bonds are dated March 1, 1913, and convertible after three years and within 12 years.

Santa Barbara Gas & Electric Company, a subsidiary of Southern California Edison Company, has called for payment July 1, at 105, its outstanding $842,500 first-mortgage 6-per-cent bonds. The company has authorized a new mortgage of $3,500,000, and $1,000,000 of bonds to be issued under this have been purchased by bankers subject to the approval of the California Railroad Commission. Earnings of the company for the year ended February 29, 1916, were $336,798 gross and $163,194 net.

Showing the net income of the Pacific Telephone & Telegraph Company, operating in the state of Washington, for the year ending December 31, 1915, to be $615,934, the report of that company was recently filed with the Public Service Commission. The report shows the exchange revenues of the company for the year were $2,800,748, while the toll revenues totaled $879,938. Miscellaneous revenues brought the total revenues up to $3,607,795, while expenses approximated $2,707,795.

Consolidation of the St. Lawrence Transportation Company and the Northern Power Company, under the name of the St. Lawrence Transmission Company, has been authorized by the Public Service Commission of New York. The transmission company operates lines through Norfolk, Raymondsville and other towns to the Canadian line. The power company operates in Ogdensburg and surrounding towns. The joint capital stock of the companies is $326,000. The consolidated company is authorized to issue this amount of stock, which will be exchanged, share for share, at par for stock of the present companies.

A deal has been consummated for the merger of the Southern California Edison Company and the Pacific Light & Power Corporation. The former company operates in Los Angeles and vicinity and has very valuable markets but lacks hydro-electric developments sufficient for its requirements. The Pacific Light & Power Corporation has at Big Creek one of the largest developments in this country. The

CLOSING BID PRICES FOR ELECTRICAL SECURITIES ON THE LEADING EXCHANGES AS COMPARED WITH THE PREVIOUS WEEK.

	Apr. 10.	Apr. 3.
American Tel. & Tel. (New York)	128	127
Commonwealth Edison (Chicago)	144	146
Edison Electric Illuminating (Boston)	239	243½
Electric Storage Battery, common (Philadelphia)	61¾	61½
Electric Storage Battery, preferred (Philadelphia)	61¾	61½
General Electric (New York)	165½	166
Kings County Electric (New York)	129	129
Massachusetts Electric, common (Boston)	6¾	7
Massachusetts Electric, preferred (Boston)	35	35½
National Carbon, common (Chicago)	—	180
National Carbon, preferred (Chicago)	—	122
New England Telephone (Boston)	136	136
Philadelphia Electric (Philadelphia)	27¾	—
Postal Telegraph and Cables, common (New York)	79¼	78¼
Postal Telegraph and Cables, preferred (New York)	68	68
Western Union (New York)	90	91
Westinghouse, common (New York)	69¾	65
Westinghouse, preferred (New York)	74	74

financial details of the merger have not been announced, but it is generally understood that the Southern California Edison Company will acquire the stock of the Pacific corporation, which is controlled by Henry E. Huntington. The Southern California Edison has outstanding $4,000,000 five-per-cent cumulative preferred stock and has authorized $26,000,000 common, of which $10,400,000 is outstanding. The Pacific Light & Power has outstanding $5,000,000 first preferred six-per-cent cumulative stock and $9,975,000 second preferred five-per-cent cumulative. Dividends are being paid on both classes of stock. Of the $25,000,000 common stock authorized, $10,559,500 is outstanding.

Dividends.

	Term.	Rate.	Payable.
Am. Lt. & Trac.	Q	2.5 %	May 1
Am. Lt. & Trac., pf.	Q	1.5 %	May 1
Bell Tel. of Penn.	Q	1.5 %	Apr. 15
Brooklyn City R. R.	Q	2 %	Apr. 15
Commonwealth Edison	Q	2 %	May 1
Com. Gas & Elec.	Q	1.375%	Apr. 15
Crocker-Wheeler	Q	1.5 %	Apr. 15
Elec. Util., pf.	Q	1.25%	Apr. 15
Ky. Secur., pf.	Q	1.5 %	Apr. 15
Milw. Elec. Ry. & Lt., pf.	Q	1.5 %	May 1
Monongahela Val. Tran.	Q	1 %	Apr. 15
Phila. Co., com.	Q	1.75%	May 1
Pub. Serv. Invest., pf.	Q	1.5 %	May 1
Va. Ry. & Pw.	S	1.5 %	Apr. 20

Reports of Earnings.

REPUBLIC RAILWAY & LIGHT.

Republic Railway & Light Company reports for the fiscal year ended December 31, 1915:

	1915	1914
Gross earnings	$3,121,297	$3,001,285
Net earnings	1,247,214	1,144,818
Other income	1,753	176
Total income	1,248,967	1,144,994
Interest charges	688,953	679,987
Preferred dividends	311,484	311,484
Surplus	248,531	153,523

HUDSON & MANHATTAN.

Hudson & Manhattan reports for year ended December 31, 1915, compares as follows:

	1915	1914
Gross	$3,725,989	$3,750,950
Net after taxes	1,997,156	2,052,406
Other income	1,025,739	1,025,898
Total income	3,022,895	3,078,304
Bond interest, etc.	2,381,763	2,357,797
*Net income	641,132	720,507

*Available for interest on adjustment income bonds.

New Publications

MAGNETIC TESTING.—A third edition of Circular No. 17, dealing with Magnetic Testing, has been issued by the Bureau of Standards. It deals with magnetic quantities, the formulas connecting them, data of magnetic materials, and methods of measurement employed at the bureau.

RESISTANCE ALLOYS.—"The Electrical Resistances and Temperature Coefficients of Nickel-Copper-Chromium Alloys," by Frederick M. Sebast, has been published by Rensselaer Polytechnic Institute. Variation of the results with different percentages of the metals is investigated, and many curves given. An alloy of high resistivity, low temperature coefficient, and commercial promise was found.

SCIENTIFIC PAPERS.—The Bureau of Standards, Washington, D. C., has issued the following papers, copies of which may be obtained upon application: "Effect of Imperfect Dielectrics in the Field of a Radiotelegraphic Antenna," by J. M. Miller; "Luminosity of a Black Body and Temperature," by P. D. Foote and C. O. Fairchild; "Inclusions in the Silver Voltameter Deposits," by G. W. Vinal and W. M. Bovard.

Proposals

FURNITURE LIGHTING.—Sealed proposals will be opened in the office of the Supervising Architect, Washington, D. C., at 3 p. m., May 2, 1916, for furniture lighting in the United States post office at Denver, Colo., in accordance with drawings and specifications, copies of which may be had at that office or at the office of the custodian, Denver, Colo., in the discretion of the Supervising Architect. J. A. Wetmore, Acting Supervising Architect.

LIGHTING FIXTURES.—Sealed proposals will be received at the office of the Commissioner of Gas and Electricity, Room 614, City Hall, Chicago, Ill., April 17, for furnishing and delivering to the Department of Gas and Electricity, electric light and gas fixtures, glassware, castings, etc., and labor for installing and connecting same in an operative condition at the municipal pier, located at the foot of East Grand Avenue, strictly in accordance with plans and specifications on file in the office of said commissioner. William G. Keith, Commissioner of Gas and Electricity.

ELECTRICAL SUPPLIES.—Bids will be received at the Bureau of Supplies and Accounts, United States Navy Department, Washington, D. C., for furnishing supplies at the following naval stations: Schedule 9480, Boston, Mass., oil-break switches, etc. Schedule 9490, Newport, R. I., electrical supplies. Schedule 9502, Brooklyn, N. Y., telephone cable and twin-conductor wire. Schedule 9503, Brooklyn, N. Y., 5,500 feet four-conductor cable, miscellaneous interior communication cable and twin-conductor cable. Bidders desiring to submit proposals should make application immediately for schedules to the Bureau, or to the Purchasing Office nearest to navy yard where delivery is to be made.

Electrical Patents Issued April 4, 1916

Prepared by Thomas Howe, Patent Attorney, 2 Rector Street, New York, N. Y.

1,177,617. Sound-Muffling Attachment for Telephonic Apparatus. L. B. Gray, Boston, Mass. Deadens effect on transmitter of sounds except those entering directly through mouthpiece.

1,177,638. Coupling. L. S. Larson and C. E. Jones, Toledo, O. For driving magneto.

1,177,658. Signaling Device for Automobiles and the Like. E. H. Smith, Jr., Chicago, Ill. Stationary lamp lights license plate and second lamp on swinging arm adjustable about first.

1,177,680. Electric Furnace. John W. Brown, assignor to National Carbon Company, Cleveland, O. For treating granular material; current passed through charge and gas heated by passing through hot treated material is burned in untreated material to preheat.

1,177,685 and 1,177,686. Electric Regulation. J. L. Creveling, assignor to Safety Car Lighting & Heating Company, Jersey City, N. J. First patent: Has special electromagnetically operated compressor resistance. Second patent: Has special coordination of carbon-pile resistances responsive to voltage and current.

1,177,694. Telegraphic Type-Printing Receiver. A. Franke and Erwin Ehrhardt, assignors to Siemens & Halske Aktiengesellschaft, Germany. Mechanism of impulse-operated device.

1,177,701. Inductor. A. B. Herrick, assignor to M. C. Messler, Pawtucket, R. I. Induction coil combined with spark plug has electric and magnetic circuits controlled by engine compression.

1,177,702. Variable Resister. J. H. Hodde, assignor to Sangamo Electric Co., Springfield, Ill. Adjustable vane in mercury chamber between electrodes is controlled by magnet.

1,177,707. Portable Stop for Electric Cranes. J. A. Jones, Chicago, Ill. Chock block for detachable connection to rail.

1,177,708. Wireless Safety Ship Signal. P. Juhasz, South Bend, Ind. Special receiving apparatus for indicating from what direction waves are received.

1,177,718. Electric Igniter. A. C. Merten, Westcliff, Colo. Make-and-break type; attachment for engine cylinders operated by cylinder compression and electromagnetically controlled.

1,177,726. Electric Lapwelding Machine. F. L. Sessions, assignor to the Standard Welding Company, Cleveland, O. Resistance type; arrangement of roller electrodes for welding pipe seams, etc.

1,177,753. Railway-Signal. J. R. Wilson, assignor to The Union Switch & Signal Company, Swissvale, Pa. Contact arrangement for signal-holding device comprising rotor and stator.

1,177,754. Printing-Telegraph Apparatus. W. Zabel, assignor to The Union Switch & Signal Company. Details of mechanism of translator.

1,177,761. Electrically Operated Valve. J. H. Clemmer, Blue Creek, Va. Valve attracted into open and closed positions by electromagnets on body.

1,177,765. Clutch-Controlling Mechanism for Motor Vehicles. R. E. Drachenberg, Detroit, Mich. Clutch manually controlled and electrically controlled upon operation of transmission.

1,177,768. Relay. J. Erickson, assignor to Automatic Electric Co., Chicago, Ill. Magnet controls contact springs, some of which are quick and others slow restoring on de-energization of magnet.

1,177,773. Railway Traffic Controlling Apparatus. C. O. Harrington, assignor to Union Switch & Signal Company. Electromagnetic devices for indicating condition of two switches at crossover.

1,177,776. Telephone System. C. F. Jones, Oakland, Cal., assignor of six-tenths to P. Smith, Boston, Mass. Has amplifying receiver and high-tension source in secondary of repeater coil and a sensitive return circuit including a transmitter and receiver.

1,177,778. Telegraph Sending Machine. J. M. Kennedy, St. Louis, Mo., assignor of one-half to E. Springmeier, Jr., St. Louis, Mo. Vibrator key.

1,177,782. Printing-Telegraph Apparatus. L. V. Lewis, assignor to Union Switch & Signal Company. Comprises a typewriter and continuously operated motor.

1,177,788. Dynamoelectric Machine. S. H. Martin, Chicago, Ill. Rotor has two squirrel-cage windings, one of which is segmental.

1,177,789. Trunking Arrangement for Automatic Telephone Arrangement. T. G. Martin, assignor to First Trust & Savings Bank, Chicago, Ill. Arrangement for crossed line conductors.

1,177,800. Vibrator. E. I. Pearson, assignor to the Temco Electric Motor Company, Leipsic, O. Comprises magnetically operated reed.

1,177,803. Coated Metal Button or Similar Article and Method of Making Same. J. F. Quinn, Providence, R. I. Metal more electropositive than silver is dipped into silver plating solution and silver plated article coated with powdered pearl and lacquer.

1,178,818. Photograph-Printing Apparatus. E. J. Schroder, Chicago, Ill. Switch mechanism.

1,177,819. Distributing Head. E. O. Schweitzer, Chicago, Ill. For a transformer pole.

1,177,841. Protecting Unit for High-Tension Electric Systems. H. W. Young, assignor to Delta Star Electric Co., Chicago, Ill. Arrangement of choke coil and horn-gap ground connection. (See cut, next page.)

1,177,842. Electric-Signaling System. S. M. Young, New York, N. Y. Block system for electric railways having direct propulsion and alternating signaling current.

1,177,848. Apparatus for and Method of Recording Fluctuating Currents. L. De Forrest, assignor to Radio Telephone & Telegraph Co., Delaware. Currents are amplified by audion and recorded by magnetic device.

1,177,857. Regulating Valve Device for Gas Supply to Ovens. H. E. Gilbert, Conshohocken, Pa. Has alarm circuit controlled according to valve position.

1,177,866. Adjustable Headlight. F. F. John, Milwaukee, Wis. Pivoted headlights actuated by remotely controlled solenoids.

1,177,872. Electric Cloth-Cutting Machine. N. Komow, Brooklyn, N. Y. Mounting of motor, gearing, etc.

1,177,881. Dynamic Control. W. S. Mayer, assignor to Niles-Bement-Pond Co., Philadelphia, Pa. Resistance control of series motor for running and dynamic braking in both directions.

1,177,894. Type Ejector for Typesetting Machines. W. J. Poole, assignor to American Lineograph Co., Los Angeles, Cal. Electromagnet gives type initial impulse down transfer chute.

1,177,896. Process of Hydrogenating Oils or Fats. W. D. Richardson, assignor to Swift & Co., Chicago, Ill. Comprises submerging arc between metallic electrodes in the oil or fat.

1,177,920. Electric Connection. W. C. Brinton, assignor to Philips-Brinton Co., Kennet Square, Pa. Connection of conductor to binding post.

1,177,923. Cap for Electric-Circuit Interrupters. W. H. Brown, assignor to Philips-Brinton Co. Readily removable cap for ignition interrupters.

1,177,924. Spark-Plug. W. H. Buckley, Bridgeport, Conn. Special structure of central electrode.

1,177,942. Automatic Train-Stop. J. Fournia, Albany, N. Y. Track and vehicle electromagnetic devices co-operate to control brakes.

1,177,948. Circuit-Breaker. B. Haskins, assignor to Allis-Chalmers Mfg. Co., Milwaukee, Wis. Oil switch has two arms, one tripped on overload and cannot be restored until other has been opened.

1,177,976. Dimmer for Automobile Headlights. C. J. Wallace, Springfield, O., assignor of forty-nine-one-hundredths to M. B. Tennant, Springfield, O. Structural details of adjustable resistance.

1,177,981. Magnetic Separator. P. Wright, Vancouver, British Columbia, Canada. Arrangement of chutes and water streams in rotary magnetic separating device.

1,177,988. Electric Relay. C. R. H. Buhl, Cleveland, O. Combination of permanent magnet and core with double wound coil for reversing its polarity.

1,177,992. Pressure Gauge or Indicator. C. A. Clouser, New Smyrna, Fla. Lamp-illuminating indicator is lighted only when pressure is on.

1,177,993. Divided Conductor for Electrical Distributing Systems. W. H. Cole, Waltham, Mass. Insulation less at predetermined points to cause breakdown at those points on development of unsafe voltage.

1,177,996. Insulator. W. J. Curry and W. A. Andrews, East Liverpool, O. Reversible cleat.

1,177,998. Spark-Plug. F. Davis, Jr., Duquoin, Ill., assignor of one-half to W. H. Meng, Duquoin, Ill. Ground electrode has rotatable hub with radiating blades in line with power electrode.

1,178,020. Means for Shaping Leaf Springs. Z. B. Leonard, Cleveland, O. Electromagnet energizes leaf support and draws it into position.

1,178,020. Telephone. R. H. Manson, assignor to the Garford Mfg. Co., Elyria, O. Switch-hook lever can be thrust inwardly so as to be protected by casing.

1,178,023. Telephone Key. G. E. Meuller, assignor to Kellogg Switchboard & Supply Co., Chicago, Ill. Party-line ringing key.

1,178,029. Electric Curling-Iron. E. Schwartz, Racine, Wis., assignor of one-third to J. L. Burgard, Chicago, Ill. Flexible heater element threaded into tortuous apertures in jaws.

1,178,034. Warning-Signal Device. W. J. St. Onge, assignor to the Garford Mfg. Co., Elyria, O. Resonator and contained reflector have same focal point at which lamp is located.

1,178,036. Grinding Machine. C. M. Stretcher, Springfield, O., assignor to C. H. Stephan, Springfield, O. Adjustably mounted motor has longitudinally adjustable rod at its axis carrying grinder wheel.

1,178,046. Signaling Apparatus. H. B. Anderson and P. Justus, Cleveland, O., assignors of one-third to E. C. Ranney, Lakewood, O. Arrangement of primary and secondary alarm circuits.

1,178,057. Electric Heater. S. G. Crane, Toledo, O. For heating flowing liquid, electric heat elements forming conveyors; means for thermally controlling flow of liquid. (See cut.)

1,178,058. Telephone Bracket. S. D. Cruse, Louisville, Ky. Details of extensible arm.

1,178,062. Moving-Picture Apparatus. T. A. Edison, assignor to New Jersey Patent Co., West Orange, N. J. Light through film of desired color at desired portions of film through film control of color devices.

1,178,066. Storage Battery. W. Gardiner, assignor to Gardiner Storage Battery Co., Chicago, Ill. Arrangement of terminals, bus bars, etc., for number of cells constituting battery.

1,178,067. Electrical Ignition System. E. Gassman, assignor to Eisemann Magneto Co., New York, N. Y. For engines; combines alternating high-tension circuit with battery.

1,178,079. Attachment for Electric Lamps. G. M. Laird, Hillsboro, Ill. For attaching lamp to dry cell.

1,178,085. Railroad Switch. G. A. Lorenz, Cincinnati, O., assignor of one-half to E. Jacob. Electrically operated turntable for electric railway.

1,178,089. Ignition Dynamo. C. T. Mason, assignor to Splitdorf Electrical Co., Newark, N. J. Normally operates on inductor principle but armature may be oscillated for suppiying initial spark.

1,178,115. Electric-Elevator Brake. C. W. Wheller, assignor to Otis Elevator Co., Jersey City, N. J. Brake shoes applied by main spring and each having independent auxiliary spring automatically operated to give extra pressure, are released by single electromagnet.

1,178,121. Circuit-Controller. J. M. Anderson, assignor to A. and J. M. Anderson Mfg. Co., Boston, Mass. Arrangement of metal resistance strips.

1,178,128. Direction Signal. O. L. Britton, Denver, Colo. For automobiles; illuminated pointer operated by special arrangement of contacts controlling specially wound motor.

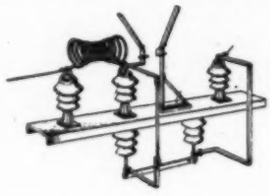
1,178,150. Flexible-Conduit Fastener. M. Guett, assignor to the Hart & Hegeman Mfg. Co., Hartford, Conn. For securing to wall of outlet box.

1,178,152. Variable-Rate Meter. C. I. Hall, assignor to Chicago Electric Meter Co., Chicago, Ill. Pressure circuit varied by magnet in work circuit.

1,178,158. Game Apparatus. F. W. Hitchings, Cleveland, O. Projectile electrically released from moving suspended car by pressing button in effort to hit target beneath.

1,178,192. System of Automatic Block Signaling for Electric Railways. F. Townsend, assignor to General Railway Signal Co., New York, N. Y. Utilizes number of connected parallel tracks for return propulsion current.

1,178,195. Electrical System of Automatic Generation and Distribution. W. F. Wanrer, Davenport, Iowa. System for automobiles, including dynamo, battery ignition, etc.



No. 1,177,841.—Protecting Unit for High-Tension Electric Systems.

1,178,199. Electrical Fuse. J. E. Wood, assignor to Metropolitan Electric Mfg. Co., Jersey City, N. J. Details of enclosed fuse.

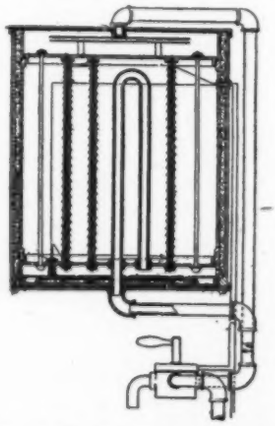
1,178,201. Semi-Indirect Lighting Fixture. H. C. Adam, St. Louis, Mo. Arrangement of top and bottom diffusing shields and reflector.

1,178,207. Terminal Bank. C. F. Baldwin, assignor to Western Electric Co., New York, N. Y. Superimposed and compressed insulating sheets and metal terminal strips for telephone lines, etc.

1,178,215. Printing-Telegraph Receiver. G. S. Conger, assignor to Dow, Jones & Co., New York, N. Y. Rotary-type wheel and electromagnetically operated mechanism therefor.

1,178,247. Contact for Subsurface Electrical Railroad Systems. O. E. Longsdorf, Chicago, Ill. Details of contact structure.

1,178,249. Trolley Wheel. H. K. McClure, Elk Lick, Pa. Hub structure.



No. 1,178,057.—Electric Heater.

1,178,267. Connecting Device for Electrical Conductors. G. L. Scheel, Chicago, Ill. Swiveled structure with ball bearings.

1,178,271. Electric Alternating Machine. C. G. Silvander, Vesteras, Sweden. End-conductor support.

1,178,291. Telegraph Key. R. L. Boulter, Los Angeles, Cal. Combination of keys of "Morse" and vibrator types.

1,178,305. Automatic Train-Stopping Device. G. H. Ennis, Derby, Conn. Train-control devices on vehicle controlled by magnets along track.

1,178,374. Push-Button Mechanism for Passenger Cars. C. H. Anderson, Cincinnati, O. Structural details.

1,178,383. Insulator. W. H. Caslow, Claridge, Pa. Special structure of bracket and insulator for securing to hollow support.

1,178,418. Manufacture of Metallic Filaments for Incandescent Electric Lamps. J. A. Scoular, assignor to Dick, Kerr & Co., London, England. Relates to making tungsten filaments.

1,178,424. Spark-Plug. J. A. Soden, Toledo, O. Gaskets and glands provided for making tight joints about insulator and central electrode.

1,178,430. Process of Electrical Separation. H. A. Wentworth, assignor to Huff Electrostatic Separator Co., Boston, Mass. Comminuted materials of different conductivity passed through electrostatic field.

1,178,431. Intermittent-Current Conveyor. J. H. Wheelock, assignor to American Model & Instrument Co., Worcester, Mass. Special structure of contact making and breaking device.

1,178,432. Intermittent-Current Conveyor for Closed Circuits. J. H. Wheelock, Worcester, Mass. Contacting device with shunt branches closed when contacts are open.

1,178,444. Theatrical Illusion Device. S. Goldini, New York, N. Y. Appliance for electrical dancing.

1,178,447. Speed Regulation of Electrically Driven Ring Spinning Frames. C. C. Hoenig, assignor to General Electric Co., Schenectady, N. Y. Speed of frame controlled according to reciprocation of ring rail and layers on bobbin.

1,178,454. Ignition Dynamo. C. T. Mason, assignor to Splitdorf Electrical Co., Newark, N. J. Structure of magneto.

1,178,455. Dynamoelectric Machine. A. H. Neuland, San Francisco, Cal. Alternating-current, commutating type.

1,178,467. Whistle-Operating Mechanism. E. H. Bullard, Springfield, Mass. Electrically and mechanically operated shutters co-operate to form sound producing opening.

1,178,471. Automatic Telephone Exchange Apparatus. G. E. Kimball, assignor to First Trust & Savings Bank, Chicago, Ill. Interrupter comprising number of reciprocally controlled relays and step-by-step switching mechanism.

1,178,472. Telephone Transmission System. A. B. Smith, assignor to J. B. Russell, New York, N. Y. Differential transmitters arranged in form of Wheatstone bridge.

1,178,479. Electric-Lamp Socket. W. M. Elliot, Austin, Tex. Details of spring switch.

PATENTS EXPIRED.

The following United States electrical patents expired on April 11, 1916:

622,657. Circuit-Breaker. H. E. Andersson, Stockholm, Sweden.

622,669. Battery Cut-Out for Electric Selector Systems. T. C. Drake, Malta, O.

622,689. Process of Making Battery Electrodes. J. C. Howell, London, England.

622,690. Machine for Making Metallic Ribbon for Battery Electrodes. J. C. Howell, London, England.

622,736. Electric Overhead Railway. J. B. Verroken, Antwerp, Belgium.

622,747. Splicer for Trolley and Other Wires. M. M. Wood, Chicago, Ill.

622,748. Rheostat. W. H. Woodman, San Francisco, Cal.

622,759. Electric-Arc-Forming Device. J. Czihowski, Vienna, Austria-Hungary.

622,785. Electric-Light Radiator. H. Stenz, Faribault, Minn.

622,865. Apparatus for Line Distribution by Inductional Transformers for Secondary Generators for Electric Railways. E. E. Ries, Baltimore, Md.

622,866. System of Electrical Distribution. C. F. Scott, Pittsburgh, Pa.

622,885. Circuit-Breaker. H. P. Davis, Pittsburgh, Pa.

622,893. Electric Igniter for Gas Engines. E. W. Graefm, Baltimore, Md.

622,910. Electrically Illuminated Advertising Sign. W. T. Bell, Nottingham, England.

622,917. Electric Temperature Indicator. J. H. Dorion, Springfield, Mass.

622,977. Electrical Steering Mechanism. A. L. Riker, New York, N. Y.

622,991. Trolley. R. E. Carroll, Lima, O.

623,006. Flexible Electrical Conductor. J. W. Gottschalk, Philadelphia, Pa.

623,009. Fire Alarm. H. E. Greene and J. W. Haley, Hot Springs, Ark.

623,022. Electric Catheter. R. P. Johnson, Chicago, Ill.

623,033. Lighting Conductor. G. Raunacher, Vienna, Austria-Hungary.

623,036. Carbon-Sorting Machine. C. T. Richmond and M. M. Zellers, Cleveland, O.

623,063. Apparatus for Measuring and Recording Electric Currents. H. Aron, Berlin, Germany.

623,104. Electrode for Electric Accumulators. H. Pieper, Fils, Liege, Belgium.

623,117. Listening Key or Circuit-Changer for Operators' Keyboards. J. Baxter, Fort Wayne, Ind.

623,118. Switching Apparatus. J. Cloos, Milwaukee, Wis.

623,119. Switching Apparatus. J. Cloos.

623,120. Switching Apparatus and Method of Counteracting Arcs. J. Cloos.